amateur radio

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DECEMBER, 1971
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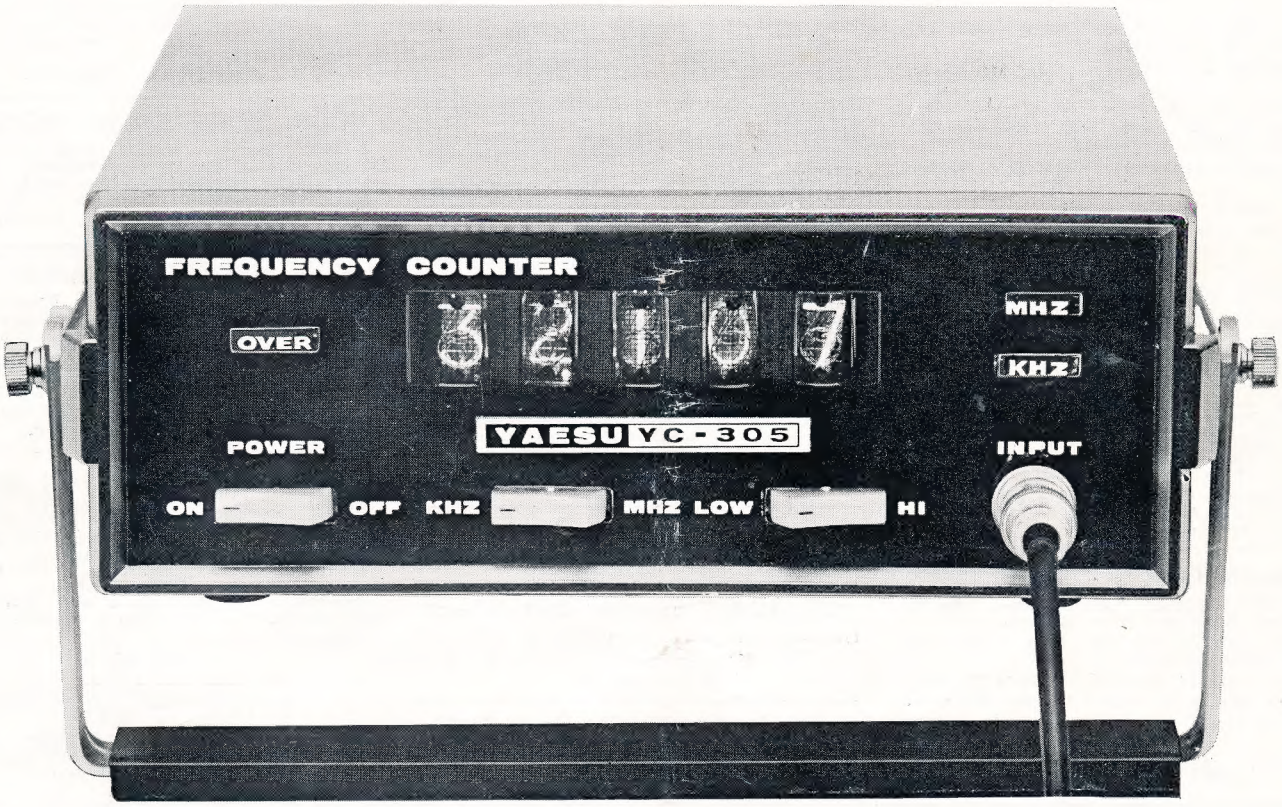

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amateur radio

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★

Members of the W.I.A. should refer all enquiries regarding delivery of "A.R." direct to their Divisional Secretary and not to "A.R." direct. Two months' notice is required before a change of mailing address can be effected. Readers should note that any change in the address of their transmitting station must, by P.M.G. regulation, be notified to the P.M.G. in the State of residence; in addition, "A.R." should also be notified. A convenient form is provided in the "Call Book".

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COVER STORY

The Yaesu YC-305 Frequency Counter is the latest product from that world famous company to appear on the market. Five-digit display with eight-digit capability reading to 30 MHz., and operating from 117/234V AC or 12V DC, makes this a very versatile instrument. Further information from the Australian agent, Bail Electronic Services.

FEDERAL COMMENT:

"FOUR PEOPLE"

Christmas and the end of 1971 is now only a few weeks away.

I wish to look back at the year just past in one particular aspect, that is the role that has been played in our Federal affairs by four people. Each of these people have been members of the Federal Executive; each has in one way or another made a great contribution to the Federal organisation. It is only right that I should draw your attention to their work at the close of this year, as in each case the Executive has lost their services during 1971.

During this year Peter Williams, VK3IZ, resigned both as a member of the Federal Executive and as Federal Secretary. Peter first became a member of the Federal Executive in January 1965, and was Federal Secretary from Easter 1965 to his retirement, with a break of only one year, when he was Assistant Federal Secretary to John Battrick.

Peter was, of course, the last honorary Federal Secretary. The role of the Federal Secretary is now undertaken by the Federal Manager. The Federal Secretary is a person that in the past has determined the effectiveness of the Federal Executive. As I pointed out so many times prior to the engagement of a paid Federal Manager, the work-load on the Federal Executive became in recent years, intolerable. A large part of this burden fell naturally upon the shoulders of the Federal Secretary.

Apart from long experience, Peter Williams brought to the job a real and lively interest in international affairs. He was one of those responsible for the Wireless Institute of Australia taking the initiative in inviting Amateur Societies in other countries to participate in the Inaugural Congress of the I.A.R.U. Region 3 Society in 1968. It was only natural that Peter would become the first Secretary of the Regional organisation. Peter has, of course, retained that role and whilst he has stepped down from the Executive he has retained his interest in the Wireless Institute as a member of the Victorian Division Council.

The second person to whom I wish to refer is Ken Pincott, VK3AFJ. Ken has been a member of the Publications Committee since 1954 and has been Editor of "Amateur Radio" for five years. He has been a member of the Federal Executive for three years and before that has, at various times, been a member of the Victorian Division Council and was President of the Victorian Division from mid 1965 to mid 1968. A little over a year ago, Ken indicated that he wished to resign as Editor of "Amateur Radio". He was persuaded to remain to allow the Institute time to employ a Manager who would undertake a significant part of the work associated with the production of the magazine and has remained until now both Editor and a member of the Federal Executive.

He has now finally resigned, both as Editor and as a member of the Executive. His service to the Institute has been recognised by the granting of an Honorary Life Membership which was presented to him at the Federal Convention in Brisbane at Easter this year. Ken, as Editor of "Amateur Radio," undertook an enormous work-load. He brought both experience and innovation to the magazine. During the period of his editorship I am sure most of the readers of the magazine will agree that it improved in all ways. As a member of the Executive, Ken contributed much with his long experience and critical approach.

Bill Roper, VK3ARZ, was a member of the Federal Executive for only 18 months. Bill, of course, had prior to this appointment, been a member of the Victorian Council, a member of the Publications Committee and at one time or another had undertaken virtually every job going within the Victorian Division. He was the Treasurer for the Federal Executive during a critical period. Without his assistance, I am sure the Federal Executive would, on the financial side, have had considerable difficulties. It was Bill who set the pattern that the Manager has been able to continue. Bill was forced to resign during 1971 because of ill health. He remains interested in the Institute and I would not really be surprised if one day we were not able to lure him back to the Federal team.

We were all saddened by the passing of George Pither, VK3VX, on 2nd July, 1971. George had been a member of the Federal Executive since early in 1967. He had been particularly concerned with Intruder Watch and with I.T.U. representation. He had only become an Amateur following his retirement from the Royal Australian Air Force as an Air Commodore, and we were lucky that the Institute was one of his many interests. I have read so many sincere tributes to George that I find it hard, even after this lapse of time, to express the tremendous debt that the Institute owes to this man. George had his own particular brand of enthusiasm, it was quite infectious and coupled with his great experience, he was an invaluable member of the Federal team. The reality of his enthusiasm for Amateur Radio can perhaps be best demonstrated by the fact that he, accompanied by his wife, went to Tokyo for the Region 3 Conference at his own expense, using the conference as the centre point for a tour of South-East Asia only a few months before his death. I respected his judgment, admired his enthusiasm and valued his support.

I have called this Federal Comment "Four People". To each of them we all owe a lot. I draw your attention to their contribution, and for us all I say, simply, thank you.

—MICHAEL J. OWEN, VK3KI,
Federal President, W.I.A.

Seasons Greetings and best wishes to you all for a Very Merry Christmas and a Happy and Prosperous New Year.

VK3 SIX METRE CONVERTER

Developed by the VK3 SPECIAL PROJECTS GROUP

There have been many new developments in the type and diversity of semiconductor design and techniques since the development of the 6 Metre Converter by the VK3 V.h.f. Group in 1967. The committee responsible for the development of this updated model felt that Amateurs wishing to use the 6 metre band of 52-54 MHz. would appreciate a new kit being made available using some of the more modern techniques and semiconductors.

DESIGN CONSIDERATIONS

The design parameters set down by the committee for this Converter were as follows:—

(1) A low noise figure, consistent with the inherent atmospheric noise found on the 6 metre band.

(2) Excellent cross modulation characteristics, particularly against adjacent television transmissions.

(3) Sufficient conversion gain, to allow the converter to be used with tunable i.f. receivers which have wide differences in their input sensitivities.

(4) The converter should have an untuned, impedance matching output stage.

(5) The output frequency range should be from the broadcast band to 28 MHz.

(6) The converter should use locally available components and cost less than $25 to construct. This price should also include the price of the crystal.

Many discussions have taken place in this magazine on the subject of converter noise. In the articles on the design of the 2 metre and 70 cm. converters this topic has been dealt with in excellent form and this leaves very little to add. During the development of this converter it was felt that the lowest noise figure was desirable, however there is a limit below which reducing the converter noise figure would bring no real benefit. External noise at 6 metres is made up of man-made electrical noise (a real problem), atmospheric and cosmic noise. Although a quiet location may eliminate man-made electrical interference, the atmospheric and cosmic components are still present. These combined are generally considered to average out at about 4 dB. at 52 MHz.

Without becoming involved in a discussion on noise measuring techniques it was decided to measure the noise and gain figures of this converter by the same method used on the VK3 V.h.f. Group's 144 and 432 MHz. Converters. The equipment used for these determinations was a Rhode and Swartz Psophometer.

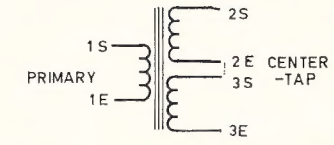
If the basic circuit is examined it can be estimated where noise will be generated. The bandpass r.f. filter has an insertion loss of 0.5 dB. and the i.f. amplifier stage (Q3) a noise figure of 2 dB. The conversion loss of the balanced mixer has been shown to be close to 7 dB. The combined total of these figures would give such a converter an effective noise figure of 9.5 dB. By including a low noise pre-amplifier ahead of the mixer circuit, the noise figure of the converter can be reduced to that of the amplifier by ensuring that this pre-amplifier stage has a gain of at least 10 dB. above the figure previously calculated. The device finally selected was the Motorola MPF121. This MOSFET gives in an unneutralised configuration 25 dB. of gain, which is slightly more than required. Because a balance between gain and cross modulation must be reached, r.f. amplifier gains much higher than this are undesirable.

The input sensitivities and related signal-to-noise ratios of modern communication receivers are of such a nature that only moderate conversion gain is necessary to produce very good results from a converter. However, many types of receivers, some of which come from disposal sources, require a higher conversion gain to produce optimum performance. The conversion gain of this converter may be varied by inserting the required value of resistance in the source of the i.f. amplifier. The value of this resistance R9 and the conversion gain obtained with an i.f. output at 8 MHz. is shown in Fig. 5. Slight differences in conversion gain to that shown in Fig. 5 will result at different i.f. frequencies with the tendency of the gain to decrease as the output frequency increases.

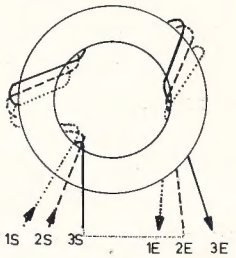
DESCRIPTION

The circuit diagram is shown in Fig. 1. The converter has been designed round a double balanced hot-carrier diode mixer. Hot-carrier diodes make high frequency mixing in this type of circuit possible and although diodes may be used it was felt that the extra cost of the HP-2800 diodes were justified when the results of the converter were assessed.

The balanced mixer transformers use ferrite toroids. The windings are close coupled and when used in conjunction with the hot-carrier diodes may be used at frequencies in excess of 200 MHz.



SCHEMATIC OF T1 & T2 SHOWING TRIFILAR WINDINGS



WIRES 2E & 3S TWISTED TOGETHER TO MAKE TRANSFORMER CENTER-TAP

FIG. 2. TOROIDAL TRANSFORMERS

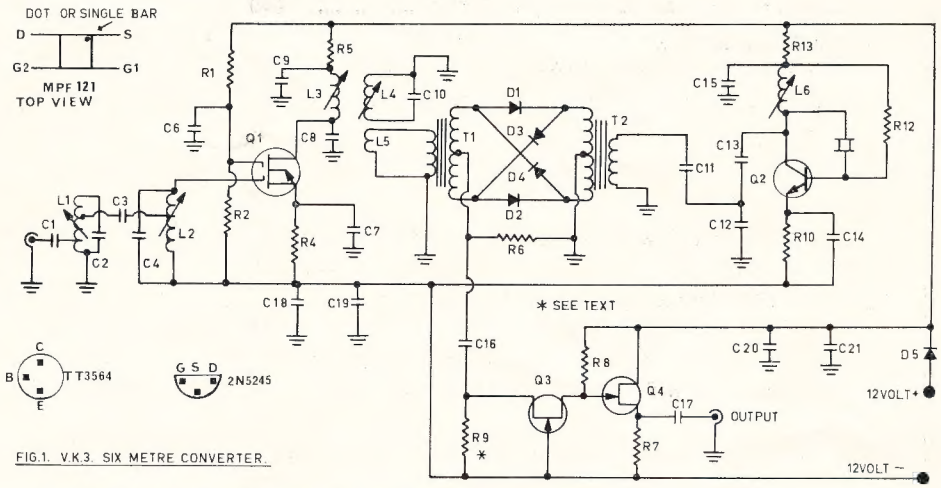


FIG. 1. V.K.3. SIX METRE CONVERTER

C1, C6, C7, C9, C14, C15, C16, C19, C21—0.001 uF.
C2, C4, C13—15 pF.
C3—3.3 pF.
C8—27 pF.
C10—22 pF.
C11—68 pF.
C12—150 pF.
C17—0.0047 uF.
C18, C20—0.047 uF.
C5—not used.

Single tuned front-end:
C2, C3—not used. C4 changes to 6.8 pF.

R1—82K ohm.
R2, R12—100K ohm.
R4, R9—220 ohm.
R5, R13—100 ohm.
R6—1K ohm.
R7—2.7K ohm.
R8—6.8K ohm.
R10—1.5K ohm.
R3, R11—not used.
D1 - D4—HP2800 hot-carrier diodes.
D5—SD55 silicon diode.
Q1—MPF121 or similar.
Q2—TT3564 or 2N3564.
Q3, Q4—2N5245/TIS88 or similar.

* C/o. 478 Victoria Parade, East Melbourne, Vic., 3002.

SIDEBAND ELECTRONICS ENGINEERING

After selling my entire stock of YAESU MUSEN Transceivers, imported under by-law privileges at reduced import rates, which cannot possibly be repeated in the future, I have had to disappoint a large number of Amateurs who for one reason or another missed out. Meanwhile the Japanese Yen currency has increased in value, now already 7% with respect to the Australian Dollar and consequently future imports will cost even more than they were before last June or from other sources.

In order to help those unfortunate Amateurs I am willing and prepared to import another limited quantity of YAESU MUSEN Transceivers, paying the full import duties at the higher cost, but selling them strictly at **cost price**. Under the present monetary situation, and therefore with restriction, those prices will be:—

YAESU MUSEN FT-101 Transceivers, AC/DC solid state $640
FT-200 Transceivers, with AC supply/speaker unit $400
FT-DX-560 AC Transceivers, equivalent to the FT-DX-400 .. $540
FT-DX-401 AC Transceivers, the latest models with CW filter, final amplifier fan and noise blanker $600

But remember, these are actual cost prices, no profit on them and only a special service for those who came too late in the past and for a limited quantity only, so don't delay to get that Christmas present! If the Yen goes up further in value, naturally these prices will increase automatically in the same ratio.

OTHER GOODIES, STILL IN STOCK:

MIDLAND PRODUCTS

One Watt Transceivers, 27 or 28 MHz. operation $37.50
Crystals for 27.065, 27.085, 27.240, 27.880, 28.100, 28.200, 28.300, 28.400, 28.500 operation, per Pair $3
12 Volt re-chargeable nickel-cadmium Batteries $10
AC Chargers for nickel-cadmium Batteries $10
SWR METERS, with two 100 micro-amp. Meters, reads forward and reflected power simultaneously $20
SWR METERS, single meter, standard type $12
DYNAMIC MICROPHONES:
PTT mobile hand-held type, metal case $10
PTT table type $15
PTT table model with 0-60 dB. built-in two-stage pre-amplifier $25
HEADPHONES, light-weight, excellent quality, 8 ohm impedance $6
TRANSCEIVERS, 240V AC, 5 watt type, 27 to 28 MHz., xtal controlled with six sets of crystals, still only $100

HY-GAIN TH6DXX Tri-band Master Beam $220
HY-GAIN 18AVT, new, 10 to 80 mx Vertical, due to arrive soon $80
MOSLEY TA33JR Junior Tri-band Beam $105
MOSLEY MUSTANG Tri-band Beam, the high-power version of the TA33JR $130
KATSUMI ELECTRONIC KEYERS, Model EK-26, reduced to $50
EIMAC 3-500-Z Linear Amplifier Tubes $37.50
CETRON 572B/160TL Linear Amplifier Tubes, per Pair $45
CRYSTALS, FT-241 type, 400-500 KHz., per box of 80 crystals, clearance sale $10
GALAXY V. VOX Units $25

USED EQUIPMENT

YAESU FT-DX-400 Transceiver, as new, demo. set .. $400
HEATH Maurauder 10-80 mx SSB, etc., tx AC operated $125
HEATH HR-20 10-80 mx Amateur Band Receiver, needs external AC supply $60
BC-348-Q and BC-348-R Receivers, clean units $50
COLLINS KWM-2 Transceiver, with clip-on AC supply-speaker unit $700

All prices quoted are strictly net, cash with order, sales tax included in all cases, subject to alteration without prior notice.

SIDEBAND ELECTRONICS ENGINEERING

P.O. BOX 23, SPRINGWOOD, N.S.W., 2777 **Proprietor: ARIE BLES**

Telephone, note the new number: **Springwood** (STD 047) **511-636**

The method of winding these transformers is shown in Fig. 2 and provided the drawings are followed it is easy to make an acceptable double balanced mixer. Due to the small size of the ferrite toroids, it is possible to build the complete mixer within the area of a double Neosid can. Not only does this give good isolation, but of greater importance, reduces local oscillator radiation from the converter.

A double tuned bandpass filter is used in the front end, however this is not a mandatory requirement. The input coil L1 can be omitted if required and the input tap from the aerial made on L2. The r.f. amplifier uses the MPF121 MOSFET. Unlike devices as the 3N140, the makers have built into the silicon chip small diode elements which protect the insulated gates and allow the device to be handled in a similar manner to JFETs and bipolar transistors. The output of the pre-amplifier passes into a further tuned pair of L3 and L4. Due to the low input impedance of the balanced mixer, a link L5 over the hot end of L4 is used.

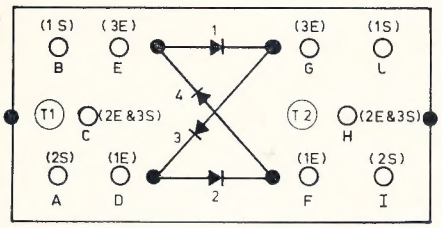
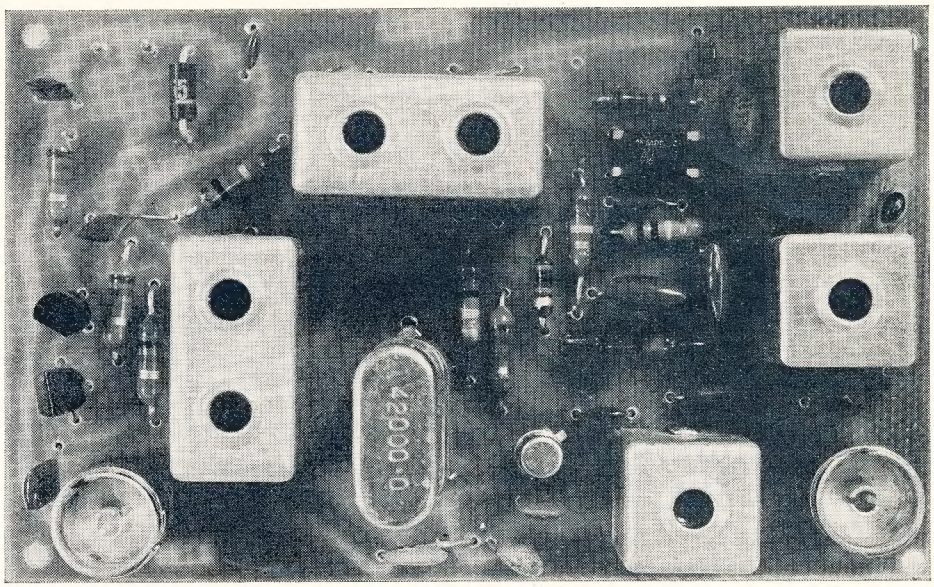


FIG. 3. BALANCED MIXER LAYOUT

A source follower output stage is used to match into the front ends of tunable receivers. The input impedance of this stage is high and to match this to the low impedance output of the mixer a grounded gate i.f. amplifier is used. The gain of this stage can be varied by the selection of a suitable resistor R9 from the graph in Fig. 5.

The oscillator uses a third overtone crystal and injection into the mixer



at the correct impedance is via the capacitive dividing network of C12 and C13.

The converter has been designed with both the positive and negative supply rails isolated from earth. Diode protection has been included in the positive supply rail. The diode will protect the semiconductors against a reversed voltage supply, but will not serve any purpose against transistors incorrectly mounted in the board.

A supply voltage of 11-15 volts at 15-20 mA. d.c. is required. The design voltage was 12.6v. The converter is constructed on an epoxy fibre glass board 4½" x 2½". All capacitors below 200 pF. are NPO disc ceramic. Above this value, ceramic or polyester capacitors can be used. Resistors must be of small physical dimensions and ratings up to ¼ watt are suitable. The coil formers used are Neosid type A (single assembly) and type B (double assembly), both with screening cans. F29 v.h.f. tuning slugs are used throughout.

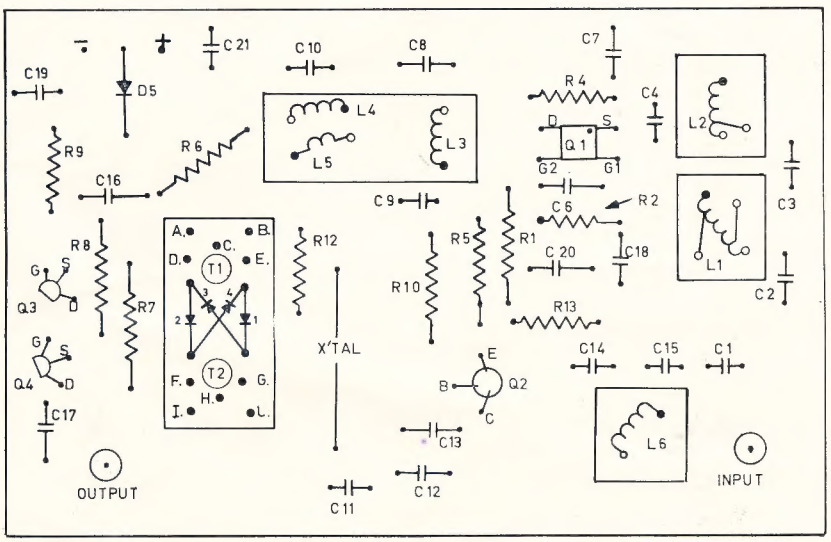


FIG. 4 BOARD LAYOUT

PERFORMANCE

All prototypes measured had noise figures of better than 3.5 dB. The conversion gain is adjustable from 25 dB. to 60 dB. One unit was measured at 52.5 MHz. with an i.f. output of 8 MHz. at a maximum of 68 dB.

When using the double tuned front end with all coils peaked on 52.5 MHz., a —3 dB. bandwidth of 250 KHz. was obtained. By stagger tuning each of the bandpass pairs 250 KHz. either side of the centre frequency, a —3 dB. bandwidth of 750 KHz. was obtained. L1 and L3 were adjusted to the higher side and L2 and L4 to the lower side. Eliminating L1 and peaking all coils on 52.5 MHz., a —3 dB. bandwidth of 460 KHz. was obtained. The stagger tuning of L2, L3 and L4 resulted in a bandpass in excess of 1 MHz.

No measurements of cross modulation have been performed. However, qualitative on-air tests have shown that the converter exhibits excellent characteristics.

CONSTRUCTION

Full constructional details will be supplied with the kits which will be available early in December. For those not wishing to obtain a kit, a few hints may be useful.

First wind the balanced mixer transformers. This is done by taking three by two-foot lengths of 30 gauge B. & S. enamelled wire and carefully twisting them together until five turns per inch is reached. Cut this twisted length in half, one piece for each of the transformers. Wind twelve turns onto each toroid and label the ends as shown in Fig. 2. If a printed circuit board is not being used, the two transformers and four diodes can be mounted on a Neosid type B base and the appropriate wires soldered to the pins. The unit can then be covered with a type B aluminium can.

The remaining components can be mounted in any order. However, we have found it expedient to mount the coil formers and wind the coils as the next step. Although no special pre-

cautions are necessary for handling the semiconductors, they should be pushed down to $\frac{1}{8}$" from the board.

ALIGNMENT

With the supply voltage connected, tune the oscillator coil L6 for maximum voltage drop across R10. The 5-volt range of a multimeter will be suitable. Switch the supply voltage off and on a number of times to ensure that the oscillator starts reliably each time.

Wind all v.h.f. slugs fully in and then apply a suitable signal to the converter. If a signal generator is not available, an oscillator can be built using the transmitter crystal. A suitable circuit was published in an excellent article written by R. Higginbotham in "Amateur Radio," December 1970, page 9.

Tune L3 until a signal is heard in the receiver. The remaining coils can now be tuned, starting with L4 and working towards the aerial coil L1. As each coil approaches resonance a slight amount of interaction may be noticed. Reduce the signal strength and re-peak each coil, starting at L3 again until maximum sensitivity over the desired bandpass is achieved.

If required, the converter gain can now be adjusted. A number of Amateurs have found it a good rule of thumb to increase the gain until the aerial noise produces a 1-2 dB. reading on the signal strength meter, but others increase the gain until a small amount of aerial noise is just heard. However, as this is a matter of choice, it is best left to the Amateur to satisfy his own individual requirements.

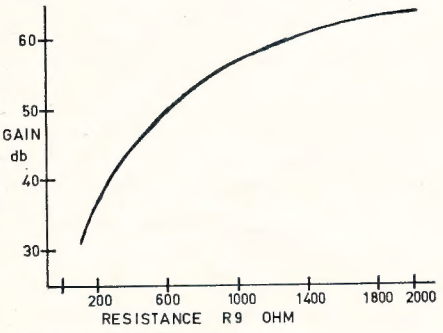


FIG. 5 CONVERTER GAIN

COIL DATA

General:

L3—8½ turns 24 B. & S. wire, close wound.
L4—8 turns 24 B. & S. wire, close wound.
L5—2 turns 24 B. & S. wire, close wound, close coupled to L4.

Double tuned front-end:

L1—11 turns 24 B. & S. close wound, aerial input at 3 turns from earth end, output to C3 at 8½ turns from earth end.
L2—10½ turns 24 B. & S. close wound, input from C3 at 8 turns from earth end.

Single tuned front-end:

L1—not used.
L2—10½ turns 24 B. & S. close wound, input from C1 at 3 turns from earth end.

Oscillator Coil, L6:

Close wound with 24 B. & S. wire.

Freq. of Crystal	No. of Turns
48-52 MHz.	10
42-48 „	12
38-42 „	15
34-38 „	18
30-32 „	23

AVAILABILITY

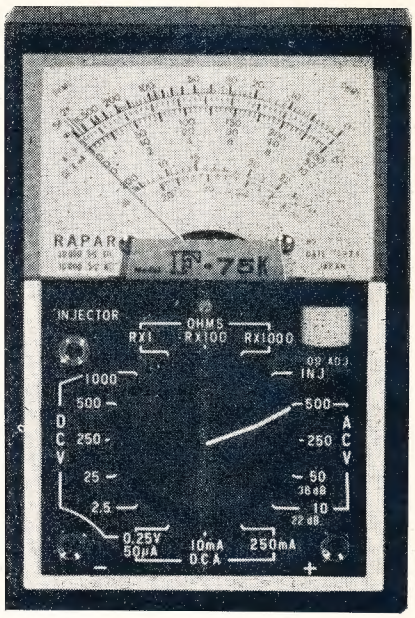
A limited number of these kits will be made available through the Disposals outlet of the VK3 Division. The kit contains all capacitors, resistors, semiconductors, coil formers, ferrites and wire. The builder will need to supply his own crystal at the third overtone frequency. Those made by Hy-Q Electronics (specification number HS291) are suitable. The price of the kit is $15.50 including normal postage and can be obtained by writing to either—

W.I.A. Disposals
(Victorian Division),
P.O. Box 65,
Mount Waverley,
Victoria, 3150,

or to the Divisional office—

6 Metre Converter,
W.I.A. Vic. Division,
P.O. Box 36,
East Melbourne,
Victoria, 3002.

NEW MULTIMETER



Radio Parts in Melbourne have introduced a versatile multitester that will find many applications for use in laboratories and servicing operations. Designated "Rapar" Model F-75K, this tester offers 30,000 ohms per volt d.c., and 10,000 ohms per volt a.c., and is fitted with a burn-out proof device. Other features include a wide range of voltage and resistance measurements, current and decibel measurements, and an in-built signal injector for checking audio or radio circuits.

Further technical data is available from Radio Parts Group, 562 Spencer St., West Melbourne, Vic., 3003, or Tel. 329-7888.

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Regulated Power Supply for Transistor and Integrated Circuit Projects

D. J. McWILLIAM, VK4ZDJ*

The following circuit for a low voltage power supply should be of interest to those who require an inexpensive, but well-regulated variable supply for use with transistor and integrated circuit projects.

The supply is based on the National Semiconductor 5 volt regulator integrated circuit LM309K. This unit is mounted in a TO-3 package and has an output rating of 1 ampere. A TO-5 package is available but the rated maximum output is only 200 mA. provided adequate heat sinking is used.

From the manufacturer's data sheet: "The regulator is essentially blow-out proof. Current limiting is included to limit the peak output current to a safe value. In addition, thermal shutdown is provided to keep the IC from overheating. If internal dissipation is too great, the regulator switches on and off with a duty cycle that prevents excessive heating."

Output Range	DC Input Voltage	R1
5 to 20 V.	>23 V.	500 Ω
5 to 25 V.	>28 V.	330 Ω
5 to 30 V.	>32 V.*	250 Ω

Table 1.

* Note: Maximum input voltage 35 V.

The LM309 is a very complex unit comprising a total of nineteen transistors and fifteen resistors. The device does not use a zener diode for the internal reference. Instead, the reference is developed from the highly-predictable emitter-base voltage of the transistors.

The choice of this device gives all the features available in expensive supplies and only necessitates a few external components.

The circuit described is a dual supply designed for IC projects, but a single supply would be adequate for the majority of transistor projects.

The power supply is assembled in an amplifier cabinet measuring 8½" wide x 4½" high x 6½" deep. This cabinet is readily available from Radio Parts, Melbourne (Type AC3). The two power transformers used have a multi-tapped secondary winding rated at 2 amperes and are available from A and R Transformers (Serial No. 6978). The diodes used are 1 amp. 50 p.i.v. types, available from most suppliers.

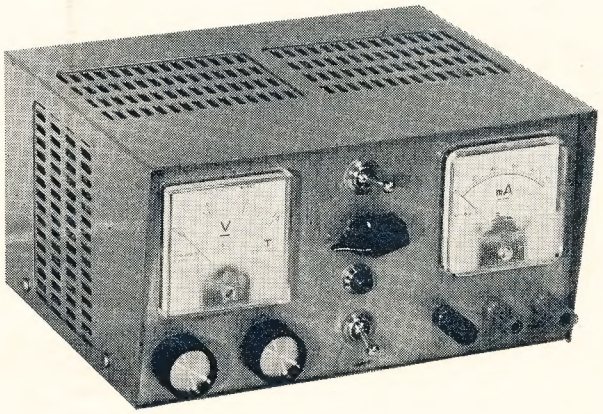
The two regulators are mounted on a standard heat sink which is mounted vertically at the rear of the cabinet. All the other components, with the exception of potentiometers and switches are located on a printed circuit board mounted vertically in the cabinet immediately behind the two meters.

A 0-15 volt, 2" x 2" meter is located on the front panel and is switchable from one supply to the other by a two-pole, two-position switch located at the centre of the front panel.

In series with one of the supplies is a current meter which may be switched to give either 0-100 mA., or 0-1 A. f.s.d. The resistor, R2, is made from a short length of resistance wire such that its value is approximately one-ninth of the internal resistance of the current meter. This can be very easily achieved experimentally.

The data sheets for the LM309K state that for a variation of 7v. to 25v. input, the line regulation is typically 4 mV. and that the load regulation is typically 30 mV. over the current range 0 to 500 mA. The maximum input voltage is 35 volts. Measurements on the constructed supply operating at 10 volts and 20 mA. current showed that the residual ripple voltage at the output was below 1 mV.

Should constructors wish to have a different voltage output range, then the 1.0K ohm resistor (R1) should be replaced with one of the values given in Table 1.



* 67 Parkside Flats, Railway Avenue, Mt. Isa, Qld., 4825.

TECHNICAL ARTICLES

Readers are requested to submit articles for publication in "A.R.," in particular constructional articles, photographs of stations and gear, together with articles suitable for beginners, are required.

Manuscripts should preferably be typewritten but if handwritten please double space the writing. If possible collaborate with any local draughtsman, student or engineer to do illustrations after the method shown in "A.R.," May 1971, page 5. Otherwise drawings will be done by "A.R." staff.

Please address all articles to:
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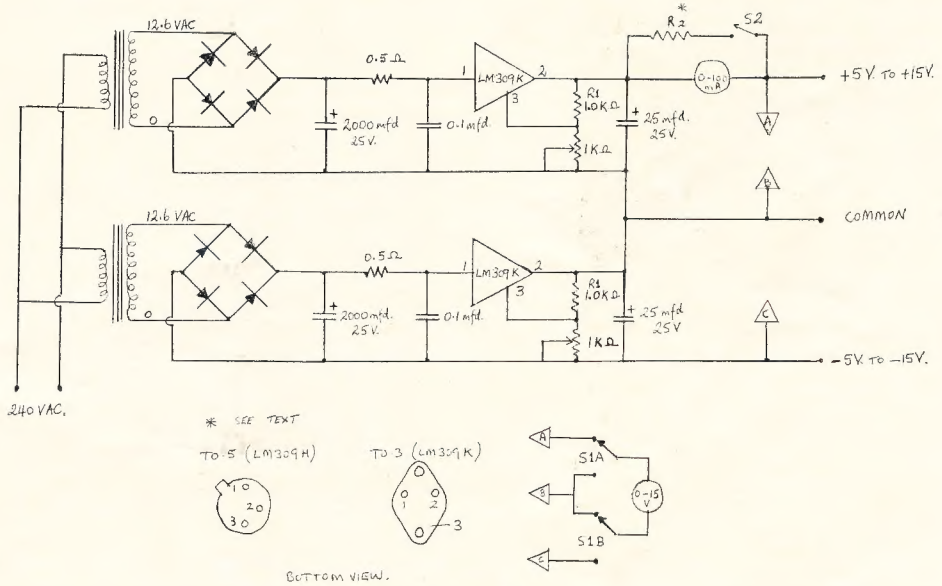

Basic Circuit for the Regulated Supply

Hy-Q Electronics

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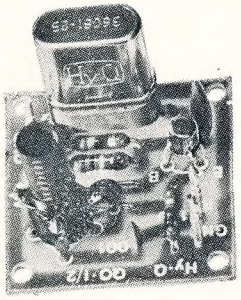

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OSCILLATOR KITS FOR THE AMATEUR

OSCILLATORS

Hy-Q Electronics have introduced a range of oscillator kits for the serious Amateur and Professional man.

Types QO-1 and QO-2 are supplied as kits containing the components required for the construction of a frequency source of good accuracy. A crystal is not supplied as part of the kit and should be ordered separately.

The oscillators cover the frequency ranges of 3 to 20 MHz. and 20 to 60 MHz. The QO-1 is a fundamental mode oscillator and the QO-2 operates in the third overtone mode.

The oscillators employ a broadly tuned circuit providing crystal controlled operation over the specified frequency ranges.

Power output is 1 milliwatt and is adequate for a wide variety of applications.

Specifications:

Frequency range: QO1 3 to 20 MHz.
QO2 20 to 60 MHz.

R.F. output: Minimum of 200 millivolts RMS across 50 ohms.

Power requirements: 6 volts DC at 20 mA. maximum. The oscillators will operate satisfactorily over the range 4 to 9v.

Operating temperature range: 0° to 60°C.

Dimensions: 1½ x 1½ x 1¼ inches (38 x 38 x 32 mm.).

Mounting: Four 1/8 inch (3.1 mm.) holes on 1¼ inch (32 mm.) centres. Tubular spacers are supplied for above chassis mounting, alternatively the oscillators may be mounted over a cut-out 1¼ in. (32 mm.) square with 3/16 in. (5 mm.) radius corners.

FREQUENCY MARKER

The type QO-3 is a frequency marker intended for use as a convenient source of reference signals at 1,000, 500, 100 and 25 kHz. with accuracy adequate for many experimental requirements. The signals are available singly or simultaneously, depending on the use of the optional selector switch.

The output at each frequency is of the order of 1 volt peak-to-peak and is of such a waveform as to provide harmonics of adequate amplitude for ready detection up to approximately 30 MHz.

The QO-3 marker is normally supplied in kit form with all of the components including the crystal required to assemble the unit on a single printed circuit board, the optional selector switch is connected to the board by short flexible leads.

Specifications:

Output frequencies: 1 MHz., 500, 100, 25 kHz.

Accuracy: Adjustable against external standard or standard frequency transmission to within 1 ppm.

Stability: Typically over 8-hour period and plus or minus 2% supply voltage change, within 3 ppm.

Output voltage: At each frequency approximately 1 volt peak-to-peak.

Output waveform: Distorted pulse with harmonics to 30 MHz.

Power requirements: 9 volts DC plus or minus 5% at maximum of 25 mA. Other voltages with plus or minus 5% stability by change of resistor.

Mounting hole dimensions: Four 0.125 in. (3.1 mm.) holes on 1.75 in. x 2.75 in. (44.5 x 69.9 mm.) centres. If mounted on chassis without spacers, a 1.75 in. x 2.75 in. (44.5 x 69.9 mm.) cut-out with a 0.3125 in. (8 mm.) radius corners is required.

ON WITH THE SHOW

Up in North Queensland the active Amateur fraternity are members of the Townsville Amateur Radio Club. It is a strong club that believes in actively involving its members in interesting projects and not surprisingly these projects seem to reflect the Amateur's community spirit. For far too long, the North has been regarded by the rest of Australia as a sleepy hollow that grows a few coconut palms. Yes, we do rig antennas on coconut palms, and yes we do have a good sleep after the R.D. Contest, but there the similarity ends.

Queensland has more cities of 40,000 population and over than has any other State, and Townsville (population 72,000) is regarded as the Capital City of North Queensland. Thus it is important that the Townsville Amateur Radio Club should not just accept affiliation with the W.I.A. Queensland Division, but that it should be able to hold its own with the Capital City Clubs. Indeed, club members have won every section in the Annual State VHF/HF Contest for the past three years.

As part of the most recent club project, VK4TC, the club station, was taken to the annual Townsville Show. The objects of the display at the Showground were: (1) To recruit starters for the club's current A.O.C.P. classes, (2) To put the club's activities before the public, and (3) as a technical exercise for club members.

And what a technical exercise it was! Because Showgrounds are, electrically speaking, very noisy areas the committee organising the operation of VK4TC decided that the station should transmit from the site but a remote receiver should be set up in a quiet location and that received signals should be linked into the Showgrounds via an FM carrier. In addition, a 53.032 MHz. two-way link was provided as liaison frequency between the transmitting and receiving stations.

Mount St. John, five miles line of sight west of the Showgrounds was chosen as the receiving site. Here the proverbial antenna farm was installed, all co-ax cables feeding a Trio TS510D HF Transceiver. The transceiver audio output was fed electrically to a home-brew ten watt 146 MHz. FM transmitter. A 10 watt 53.032 transceiver and a TV set were also provided for the remote site operator.

At the show, the duty operator monitored his transmission frequency via the 146 MHz. FM link receiver. Instructions to change frequency were sent on the 53 MHz. liaison channel. An FT-200 tx feeding a TA33JR beam was used on HF from the Showgrounds. As a new country was contacted, it was marked on a large map behind the station operator.

Bill Sebbens, VK4XZ, talking to the Showgrounds on 53.032 MHz. AM liaison frequency. The TS510D was used as the main HF receiver at Mt. St. John.

Of course there are always eventualities that no committee can really foresee. This display was no exception in this regard. Half way through the show, the local Civil Defence Group decided to fire up their emergency SSB transceivers operating just above 3700 KHz. As their equipment was located next to the T.A.R.C. display, their 80 metre transmissions were blocking our receiver and vice versa.

In true Amateur style, improvisation was immediately necessary. The operator at the Showgrounds fed audio down the 6 metre link to Mt. St. John where he was relayed on HF via the Trio TS510D. The received signal was then linked back to the show via 2 metres FM. In fact, the system was further simplified when the remote station operator put the TS510 into VOX operation. The Showground operator was then able to call and listen automatically.

This year's display was eminently successful because it involved most members of the Radio Club and equally importantly, many of the general public. Perhaps your club can help fly the Amateur Radio flag and get "on with the show". It's certainly a very worthwhile effort.

(Story and Pictures by Peter J. Lindsay, VK4QD/T.)

Bob Grummitt, VK4ZRG (left), and Bill Sebbens, VK4XZ, installing the 146 MHz. FM link antenna at Mt. St. John. This picture is of interest to those who have had poor results when trying to photograph antennas. This shot was taken at 10.30 a.m. using Kodak 32 A.S.A. Panatomic X film and an electronic flash. The camera was fitted with a 3-stop red filter which has had a startling effect on the blue sky.

Peter Renton, VK4PV, manned the FT200 at the Showgrounds. The 146 MHz. receiver at the left was used to drive a large monitor speaker. The map in the background shows countries worked from the site.

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A VERY MERRY CHRISTMAS AND PROSPEROUS NEW YEAR

FILTER TYPE S.S.B. TRANSMITTER

C. RENTON,* VK4CR

Being a comparative beginner in s.s.b., the writer desires to cater for beginners by submitting the following step by step explanation of what happens in such a transmitter, using the block diagram to illustrate the steps.

Radio frequency oscillations are generated in the **carrier oscillator**, this fixed frequency being governed by the frequency to which the carrier crystal has been ground or etched, or perhaps lowered slightly in frequency by rubbing soft solder on one or both faces.

The 3-30 pF. trimmer across the carrier crystal permits a very slight adjustment of the carrier frequency.

As an example, let us say the carrier crystal is at 4994.2 KHz.

* 16 Wilson Street, Booval, Qld., 4304.

This r.f. signal, called the **carrier**, is fed into the **balanced modulator** which consists of two small diodes, a 1K potentiometer and a bifilar wound coupling coil, the latter being wound around the carrier oscillator coil.

In the meantime a very low frequency signal is being introduced by the operator's voice, per the microphone, to the **first audio stage** and amplified in an **audio amplifier stage.**

From the latter it travels to the **balanced modulator** as arrowed in the diagram.

It will thus be seen that two signals are now meeting in the balanced modulator, the high frequency carrier signal and the very low frequency audio signal.

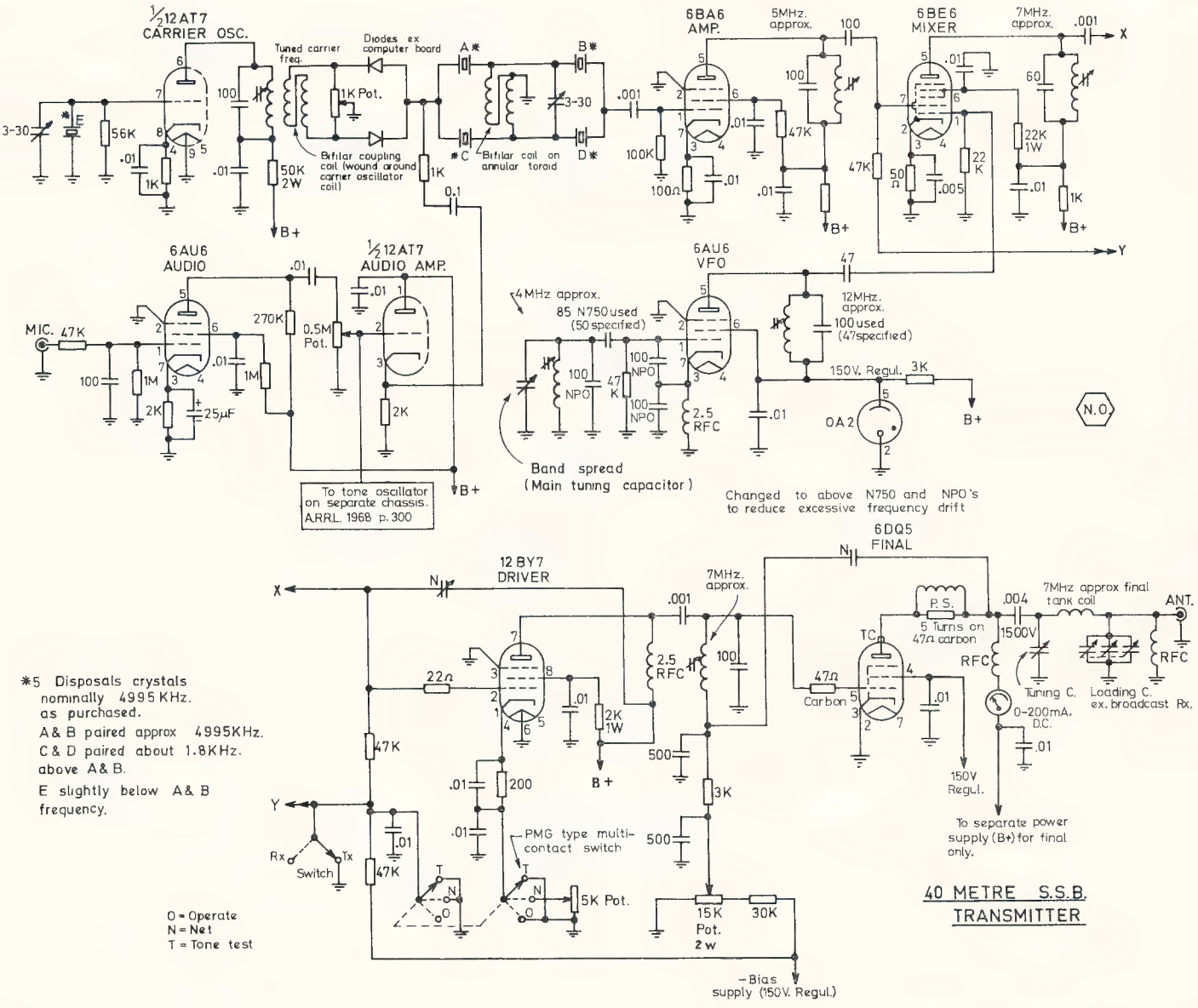
To make matters a little clearer, we will assume that the frequency of a single tone of, say, 1,000 Hz. (1 KHz.) is the audio signal instead of the varying frequencies of the human voice.

The carrier signal, assumed as above as being 4994.2 KHz., mixes with the 1 KHz. audio signal to produce two new frequencies by addition and subtraction respectively, thus 4994.2 + 1 = 4995.2 KHz. and 4994.2 — 1 = 4993.2 KHz.

These new frequencies are called upper and lower sidebands respectively of the original 4994.2 KHz. carrier and **both** of these sidebands proceed to the next stage.

However, the balanced modulator has a further important duty, i.e. it must **prevent the original carrier frequency** itself from accompanying the sidebands on their way.

The next stage is the **sideband filter**, comprising mainly in our case four crystals, two being etched to a slightly



higher frequency than that of the carrier crystal and the remaining two to about 1.8 KHz. higher still. For our example, say two at 4995 KHz. and two at 4996.8 KHz.

(To be a little more technical, the carrier crystal should be located frequencywise about 20 dB. down the lower slope or skirt of the sideband filter passband curve. A second carrier crystal could be similarly placed on the upper skirt.)

Two other components of the sideband filter are a bifilar wound coil on an annular toroidal core and a 3-30 pF. trimmer, these being tuned to an intermediate position between the crystals.

The **sideband filter** will close the gate against one of the two sidebands, so that only a **single sideband** (s.s.b.) will pass on to the amplifier stage.

In our example the 4993.2 KHz. signal will be blocked and the 4995.2 KHz. signal passed.

The s.s.b. signal of 4995.2 KHz. now passes to the 6BA6 amplifier and thence to the 6BE6 **mixer**, where it will mix with an independently generated signal which issues from the **variable frequency oscillator** (or v.f.o.) to obtain the signal frequency which it is desired to transmit in one of the Amateur bands.

We will suppose it is desired to have a QSO at 7050 KHz. in the 40-metre band. The v.f.o. must generate a signal tuned to such a frequency as will produce 7050 KHz. when mixed with the abovementioned 4995.2 KHz. signal.

By addition, 7050 + 4995.2 = 12045.2 KHz. So that, if the v.f.o. is tuned to have an output frequency of 12045.2 KHz., which latter is fed into one grid of the mixer valve, whilst the 4995.2 KHz. signal is injected into another grid of the same valve, a 7050 KHz. output will be obtained from the mixer.

Thus 12045.2 — 4995.2 = 7050 KHz.

(The mixer will also produce another output by addition of 12045.2 and 4995.2 but this signal will be tuned out.)

The 7050 KHz. s.s.b. signal will now be amplified in the 12BY7 **driver stage**, which in turn passes this signal to the 6DQ5 **final power amplifier** where the s.s.b. signal is strengthened sufficiently to be fed via a pi coupler to the antenna.

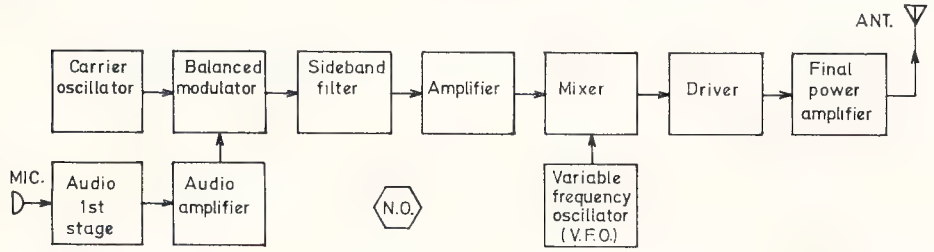
Reverting to the v.f.o., in my case, for the 40 metre transmitter, the input to the v.f.o. valve was set at one-third of the frequency of the v.f.o. output, so that for the above example, the v.f.o. input would be tuned by means of the bandspread variable capacitor to 12045.2 ÷ 3 = 4015.06 KHz.

Both condensers of the pi coupler require to be carefully manipulated to dip the final to resonance coincident with the lighting of a suitable dummy antenna lamp in the first instance (I used a 75w. 240v. lamp), with a further check when the antenna lead-in cable is connected.

I find a small pea lamp inserted in series with the antenna lead gives a good indication of whether the final is tuned correctly. One can adjust to have a very good swing of the final current meter on voice and yet not light the pea lamp.

I have altered the above home-brew to suit the 20 metre band and by choosing 14100 KHz. output to set up coil frequencies, the v.f.o. input frequency in this case being set to one half of the v.f.o. output. I arrived at the following frequencies to which to wind and set the coils:

14100 KHz. for mixer, driver and final frequencies,
Minus 4996 KHz. approx. s.s.b. from filter,
= 9104 KHz. v.f.o. output frequency required,
and 9104 ÷ 2 = 4552 KHz. required input to v.f.o. valve.



NATIONAL POLICY FOR SCIENTIFIC AND TECHNOLOGICAL INFORMATION SERVICES

Every nation needs an efficient system for the storage, retrieval and dissemination of information in science and technology if it is to take its place in the community of technically advanced countries. A new look at Australia's information needs in the fields of science and technology is now under way.

A Committee of Enquiry, with a wide-ranging membership chosen from industry, universities and colleges, C.S.I.R.O., government and libraries was recently announced by Sir Alan Hulme, Minister for the Department of the Vice-President of the Executive Council. The Scientific and Technological Information Services Enquiry Committee, under the sponsorship of the National Library, is supported by a working Secretariat of four.

The committee will examine the needs of individuals and organisations for scientific and technical information with a view to bringing forward proposals which will assist in the formation of a national policy in this important area. It will assess the adequacy and availability of existing resources and the access to them. It will also study the use of computer-based information retrieval systems drawing upon overseas experience with such systems.

The Committee of Enquiry aims to complete a major part of its work this year. Individuals or organisations wishing to submit comment or to obtain further information about the scope and objectives of the committee are invited to contact the Committee Secretariat, C/o. The National Library of Australia, Canberra, A.C.T.

Enquiries are invited for the purchase of

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These units cover 0.5 to 32 MHz. Digital readout, 1 MHz. bands. Dial reading to 200 Hz.

Finance available. Apply in writing to:

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W.I.A. D.X.C.C.

Listed below are the highest twelve members in each section. Position in the list is determined by the first number shown. The first number represents the participant's total countries less any credits given for deleted countries. The second number shown represents the total D.X.C.C. credits given, including deleted countries. Where totals are the same, listings will be alphabetical by call sign.

Credits for new members and those whose totals have been amended are also shown.

PHONE

VK5MS	319/343	VK2APK	289/296
VK6RU	316/342	VK4FJ	286/307
VK3AHO	310/326	VK4TY	284/288
VK4KS	307/322	VK4UC	278/278
VK6MK	303/324	VK2AAK	274/279
VK5AB	296/314	VK3ZE	272/275

New Members:

Cert. No.	Call	Total
122	VK4NQ	105/105
123	VK2AEB	106/108

Amendments:

VK3JW	257/258	VK3ACD	254/258

C.W.

VK2QL	303/326	VK3ARX	271/278
VK3AHQ	300/315	VK3XB	270/284
VK4FJ	289/315	VK6RU	266/289
VK2APK	286/294	VK4TY	259/272
VK3YL	286/303	VK3TL	254/260
VK3NC	273/300	VK3RJ	248/262

OPEN

VK6RU	317/343	VK6MK	303/324
VK4SD	315/330	VK2EO	301/325
VK2VN	311/330	VK3ARX	301/308
VK4KS	308/327	VK4UC	298/298
VK4TY	306/321	VK4FJ	297/323
VK2APK	303/315	VK2SG	294/300

New Member:

Cert. No.	Call	Total
137	VK4NQ	120/120

Amendment:

VK3ACD 254/259

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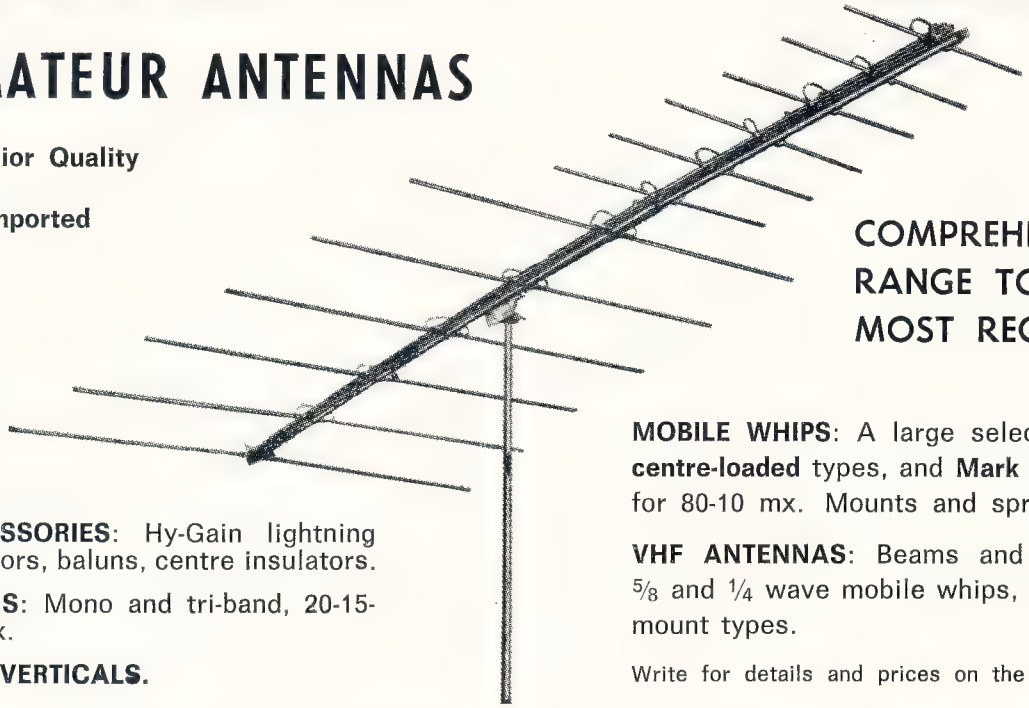

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Western Aust. Rep.: **H. R. PRIDE, 26 Lockhart Street, Como, W.A., 6152.** Telephone 60-4379

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When used with 'punched' board lay strip between rows of holes, pass component leads through holes adjacent to strip, bend the leads over the strip, cut to length and solder in the usual way. Alternatively lay strip over the holes and using a drawing pin or scriber prick a hole in the 'Cir-Kit' in the required position.
'Cir-Kit' strip can be bent or curved to whatever form you require and used on either or both sides of the board. When joining two pieces of 'Cir-Kit' bend over the end of the overlapping strip so that a metal to metal contact is made and solder in the usual way.
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Army Trek to Ayers Rock

LIEUT.-COLONEL J. McL. BENNETT, VK3ZA*

Thirty-nine apprentices from the Army Apprentices School, Balcombe, Victoria, left Balcombe on June 4 on a vehicle trek to Ayers Rock.

The trek included a rare "field-day type" h.f. radio link—s.s.b. operation from the summit of the Rock itself!

A total of 16 vehicles took part in the 20-day training exercise which was code named "Exercise Pebble".

Two former members of the Special Air Service Regiment (Capt. John George and Staff Sgt. Jock Lowson), both of whom are now on the Staff at Balcombe, used the Army's latest man-pack h.f. radio, the PRC-F1, to establish the link with the Army Apprentices School, Balcombe, Vic., from Ayers Rock.

EQUIPMENT DETAILS

Manufactured in Australia by A.W.A. Ltd. for the Australian Army, the PRC-F1 has the following characteristics:

- Frequency range: 2,000 to 11,999 KHz. in 1 KHz. steps.
- Frequency stability: ±25 Hz. between —21°C. and +71°C. over 90 days.
- Modes: S.s.b.-u.s.b. only; c.w. and a.m.
- Output power: 10w. p.e.p. on s.s.b. and compatible a.m., 5w. p.e.p. on c.w.
- Rx sensitivity: 0.5 μV. in series with 50 ohms for 1 mW. audio output in 100 ohms.
- Power source: 28v. d.c. from internal re-chargeable nickel-cadmium battery.

It is designed primarily as a man-pack transceiver, using an 8 ft. whip antenna. An adjustable dipole is also provided for sky-wave operation over extended range.

A conversion kit, including an antenna coupler, allows the PRC-F1 to be used as a ground station with greater flexibility by giving a choice of a wide range of antennas. The coupler provides efficient matching from the 50 ohms unbalanced output of the transceiver to antennas with impedances between 5 ohms and 7,000 ohms.

THE TREK

So much for the PRC-F1; now a little more about "Exercise Pebble".

The apprentices and their officers, and civilian instructors, ate combat rations and slept in the open throughout the greater part of the trip.

This living in the field under varying conditions plays an important part in the apprentices' training as do long distance vehicle movement, navigation, geography and geology, driver training and vehicle maintenance, and first aid in the field.

They visited major industries and places of interest along the way.

The expedition was conducted in two phases. During the first phase, the convoy moved from Balcombe, following the coast to Adelaide, then a general north-west route to Alice Springs along the main road.

Phase two included its return to Balcombe going through Ayers Rock, and taking a south-south-east route using the axis of the Alice Springs to Broken Hill railway line, then on through Mildura.

The apprentices spent most nights camped on the showgrounds of the various towns they passed through. In some cases they camped on the outskirts of a town while Army barracks were made available for their overnight stays at Adelaide and Broken Hill.

Fresh rations were purchased at Port Augusta, Alice Springs, Oodnadatta and Broken Hill, and meals were provided for the party by Army units at Adelaide, Woomera and Bendigo as it passed through these areas.

Among the highlights of the trip were inspection tours of the shipyards at Whyalla and the Iron Foundry at Iron Knob; a guided tour of Woomera; Opal prospecting at Coober Pedy; a day spent climbing Ayers Rock; and a guided tour of Broken Hill.

The apprentices were granted local leave, at the discretion of the Detachment Commander, Capt. A. J. George.

These phases of "Exercise Pebble" provided a break in what was essentially a rigorous training exercise.

But no matter what the conditions, the apprentices were well prepared for their trek.

Each light vehicle was fully self-supporting for the occupants, carrying rations, water and all their personal effects.

A mobile automotive repair shop and an ambulance were among the vehicles in the convoy.

In addition, each vehicle carried two-way radio equipment and communications with the Royal Flying Doctor Service, Balcombe, and Watsonia could be provided, as required, by a Signals Detachment.

The convoy arrived back at Balcombe on June 24 after covering a total of 3,446 miles and maintained communications throughout the trip.

DISTANCE CHART
AUSTRALASIAN LOCATIONS
(centre pages in Nov. "A.R.")
Can be printed on stiff paper for wall mounting, if demand is adequate, at a nominal price.

Please write in to Editor if you require a copy
(it is regretted that individual letters cannot be acknowledged)
P.O. Box 36, East Melbourne, Vic., 3002

DISTANCE CHART WALL MOUNTING?

Capt. George and S/Sgt. Lowson pictured near the summit of Ayers Rock with the 'Centre' unfolding below them—the curved horizon proves that the world is not flat! What a take-off for v.h.f.!

* Assistant Director Army Public Relations, Headquarters Southern Command.

Equipment Recommended for Operation with Amsat-Oscar-B

Three communications repeaters are being developed for the Amsat-Oscar-B series of Amateur satellites. A selection has not yet been made as to what combination will be scheduled for the next satellite. This document has been prepared to better help you get ready for operation with this series of satellites.

OPERATION WITH THE DJ4ZC/DJ5KQ 432-TO-144 MHz. REPEATER

The DJ4ZC/DJ5KQ "H" repeater, described in March '71 "Amsat Newsletter," is a multiple-access, linear translator, receiving uplink signals between 432.125 and 432.175 MHz. and repeating them between 145.975 and 145.925 MHz. on the downlink. Sideband inversion occurs in the translation process (i.e., upper sideband becomes lower sideband, and vice versa).

To transmit signals through this repeater, a 432 MHz. transmitter and antenna delivering 200-300 watts of effective radiated power (e.r.p.) is recommended. **For best results s.s.b. and c.w. should be used.** Although a.m., f.m., m.c.w. and a.f.s.k. will work with the repeater, these modes do not make efficient use of the limited repeater power and should be avoided. We recommend that a "transverter" be used to frequency-translate from 28 or 144 MHz. to 432 MHz. In this way, a ten or two-metre s.s.b. or c.w. transmitter can be converted for v.f.o.-controlled transmission on 432 MHz. For c.w. operation, an amplifier/tripler can be used to frequency-multiply the output of a two-metre transmitter to 432 MHz. (see, for example, "Ham Radio," Feb. '70). A varactor tripler can also be used (see the A.R.R.L. Handbook). Perhaps the least expensive method of generating c.w. power on 432 MHz. is to obtain a surplus 450 MHz. f.m. transmitter strip and modify it for c.w. operation on 432 MHz. An article on this approach is planned by the A.R.R.L. Headquarters staff for a future issue of "QST". It is strongly recommended that some provision for adjusting the power output of the transmitter be included. This is desirable to be able to adjust for the proper balance of satellite repeater power among users.

The antenna gain recommended for transmission to the satellite repeater will depend upon the transmitter output power. A 20 watt transmitter will require a 10-12 dB. antenna gain to obtain the recommended e.r.p. of 200-300 watts. A better approach would be to add a 200-watt power amplifier, in which case a dipole or ground plane should provide enough uplink signal to the satellite, and then there will be no need to keep the antenna pointed toward the satellite. The satellite antennas for this repeater will be circularly polarised, so that linear polarisation (either horizontal or vertical) can be employed on the ground. Circular polarisation can be expected to provide as much as 3 dB. over linear and is probably worth the effort. Because the spacecraft will be magnetically stabilised, the orientation of the satellite will be constantly changing and the sense of polarisation will depend upon ground station location. Stations in the northern hemisphere should use right-hand circular polarisation, and **those in the southern hemisphere, left-hand circular.**

For receiving, any good two-metre converter should be suitable, and a two-meter receiving antenna having a gain of the order of 10 dB. should provide good results. Linear polarisation is satisfactory, but again, circular polarisation can be expected to provide as much as 3 dB. improvement (use right-hand circular in the northern hemisphere, left-hand circular in the southern hemisphere). If a 10 dB. antenna is not available, a ground plane or crossed-dipole should provide detectable signals from the repeater's 10-watt p.e.p. transmitter. The receiver should be capable of receiving s.s.b. and c.w. (i.e. have a b.f.o., and a bandwidth less than 4 KHz.), and most h.f. receivers should be suitable for the purpose. Transceive operation is NOT recommended, because it is highly desirable that all stations be able to monitor their own downlink signals during the periods in which they are transmitting.

OPERATION WITH THE AMSAT TWO-TO-TEN METRE REPEATER

The Amsat two-to-ten metre repeater, described in March '71 issue of "Amsat Newsletter", is a multiple-access linear translator which receives uplink signals between 145.900 and 146.000 MHz., and re-transmits them between 29.550 and 29.450 MHz. on the downlink. Sideband inversion takes place in the translation process (i.e. upper sideband becomes lower sideband, and vice versa).

To transmit signals through the two-to-ten metre repeater, a two-metre transmitter and antenna capable of providing 80-100 watts of e.r.p. is recommended. **For best results, s.s.b. and c.w. should be used.** Flight tests with the repeater aboard aircraft demonstrated that a.m. and f.m. signals are not very readable when relayed by the repeater, and they make very inefficient use of the limited repeater power (1-2 watts). C.w. operation is generally possible with most two-metre transmitters. The most expedient means of achieving an s.s.b. capability on two metres is through the use of a transverter which can up-convert the output of a ten, twenty or six-metre s.s.b. or c.w. transmitter to two metres. Transverters of this type are available from several Amateur radio equipment manufacturers, and are also described in the A.R.R.L. Handbook and the V.h.f. Manuals published by the R.S.G.B. and A.R.R.L. Transverters are also usable on c.w., and have the added advantage that they provide a v.f.o. capability if the basic transmitter already has a v.f.o.

The antenna gain recommended for transmission to the two-to-ten metre satellite repeater will depend upon the transmitter output power. A 20-watt transmitter will require a 6-7 dB. antenna gain to obtain the recommended e.r.p. of 80-100 watts. It would be preferable to use a transmitter in the 50-100 watt power output class, so that a nondirectional dipole or ground plane antenna can be employed and pointing of the antenna toward the satellite will not be necessary. The satellite two-metre receiving antenna will be circularly polarised, so that linear polarisation (either horizontal or vertical) can be employed on the ground. If circular polarisation is available at the ground station, as much as 3 dB. less transmitter power will be required for good communications. Stations in the northern hemisphere should use right-hand circular polarisation, and those in the southern hemisphere should use left-hand polarisation).

Any good h.f. receiver capable of receiving s.s.b. and c.w. on the ten-metre band should be suitable for receiving the ten-metre downlink signals if the receiver sensitivity is one-microvolt/ metre or better and the local noise level does not exceed this level. A circularly polarised crossed-dipole should be adequate for receiving in low-noise environments, but a higher gain antenna, such as a three-element beam should provide better results, especially if it is circularly polarised. The satellite ten-metre transmitting antenna will be linearly polarised (a dipole), and Faraday fading can be expected to occur just as was the case for Australis-Oscar-5, unless a circularly polarised receiving antenna is used at the ground station. The use of transceivers is NOT recommended. Separate transmitting and receiving equipment should be used because it is highly desirable that all stations be able to monitor their own downlink signals while transmitting.

OPERATION WITH THE AUSTRALIS 144-TO-435 MHz. REPEATER

The Australis 144-435 MHz. repeater is a channelised, hard-limiting repeater of the demodulation-remodulation type, and is designed to handle f.m. signals only (c.w., s.s.b. and a.m. cannot be used with this repeater). The repeater receives f.m. uplink signals on 145.80, 145.85, 145.90 and 145.95 MHz., and retransmits them on 435.10, 435.15, 435.20 and 435.25 MHz., respectively, on the downlink.

Transmission of signals through the 144-435 MHz. repeater will require a two-metre transmitter and antenna capable of providing a minimum e.r.p. of 200-300 watts. **Only f.m. should be used**, with a deviation of plus or minus 7.5 KHz. [The following could also be used: A2, F2, F4 or slow scan t.v.—Ed.] Available two-metre f.m. Amateur transceivers and converted taxicab radios should operate satisfactorily, but a power amplifier should be used to increase the output power. If the power output is 50 watts, a 6-8 dB. antenna gain should be sufficient. It would be advantageous, however, to use a power amplifier in the 100-200 watt power output class so that a non-directional dipole, ground plane or vertical antenna can be employed without requiring pointing towards the satellite. The satellite two-metre receiving antenna will be circularly polarised, so that linear polarisation (either horizontal or vertical) can be used on the ground. The use of circular polarisation on the ground will reduce the transmitter power requirements by as much as 3 dB. (use right-hand circular polarisation in the northern hemisphere, and left-hand circular in the southern hemisphere).

Reception can perhaps most easily be achieved through the use of a good, low-noise 435-to-144 MHz. receiving converter, which will convert the same two-metre f.m. transceiver that is used for transmission. These converters are commercially available. A high-gain circularly polarised receiving antenna should be used, with a gain of **at least** 12 dB., because this satellite repeater is expected to provide an output power of less than one watt per channel to individual linearly polarised monopole antennas.

Reprinted from Amsat Newsletter, Sept. '71. Membership of Amsat can be obtained for U.S. $5 on completion of application form available from Federal Executive. Application to be sent to P.O. Box 27, Washington, D.C., U.S.A., 20044.

BEWARE OF . . .

CHAIN LETTERS

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Brass tip chuck, **50c.**

Brass bottom fitting, specify 3/8" UNF (SAE) or ½" Whit. thd., **$1.00.**

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S. T. CLARK

P.O. BOX 45, ROSANNA, Vic., 3084. Ph. 45-3002

Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

V.H.F. TRANSEQUATORIAL PROPAGATION

Editor "A.R.," Dear Sir,

The Ionospheric Prediction Service is currently carrying out investigations into V.h.f. Transequatorial Propagation and would be grateful for the assistance of any Amateurs who have had contacts via this type of propagation or have observed v.h.f. signals originating from countries in the northern hemisphere.

We are interested in reports dating back to 1947 if possible and, in particular, reports from January 1970 to the present.

Reports containing as much of the following information as possible would be appreciated.

(a) Date.
(b) Time (note whether local or GMT).
(c) Frequency or band (most likely to be 50 MHz., however if other signals were noticed, note approximate frequency).
(d) Signal strength.
(e) Fading characteristics.
(f) Location of your station and call sign (plus location if possible) of stations heard or worked.
(g) Other observations, i.e. was sporadic E noticed at the time; if so, what areas? Did the signals start in one area and move to another or not? When were signals first noticed and when did they disappear?

Reports should be sent to:—
Dr. L. McNamara,
Ionospheric Prediction Service,
162-166 Goulburn Street,
Darlinghurst, N.S.W., 2010.

We would be grateful for as much publicity as possible concerning this project.

—R. L. Harrison, VK3ZRY/2.

N.Z. NATIONAL JAMBOREE

Editor "A.R.," Dear Sir,

During the first week in 1972 the New Zealand Scout Association will be holding its Sixth National Jamboree at the Pukekohe Showgrounds in South Auckland.

I have been authorised by the New Zealand Post Office as Trustee for the Amateur Radio Station, which will be set up to operate during the activity period, i.e. **1st to 8th January, 1972.** The official call sign will be ZL1JAM.

It is hoped to operate on all h.f. bands daily, and between the hours of 1900 and 1200 (0700-2400 hours NZST), although other times can be arranged in the event of any prearranged schedules with overseas stations.

Members of the Franklin Amateur Radio Club and the Papakura Amateur Radio Club will be assisting in the setting up and operation of the station, and as it is anticipated that approx. 9,000 Scouts and Scouters from New Zealand, Australia, Canada, United States of America, the Pacific Islands, Japan and South-East Asian countries will be attending, the traffic activity should be fairly intensive.

An attractive QSL card is being printed for the occasion, and confirmation will be 100%.

It would be appreciated if you could give this activity some publicity through your magazine and club nets.

—John W. Hannaford, ZL1BBH.

"HIS OLD BEAM"

Editor "A.R.," Dear Sir,

In 1968 I bought, through Hamads, a TA33 Jr. from Bert Hay, VK2AGW. Since then, I have contacted Bert on odd occasions and also worked a fair share of DX using his old beam.

A few days ago I received a letter from Bert which I feel is worth a para. in "A.R."

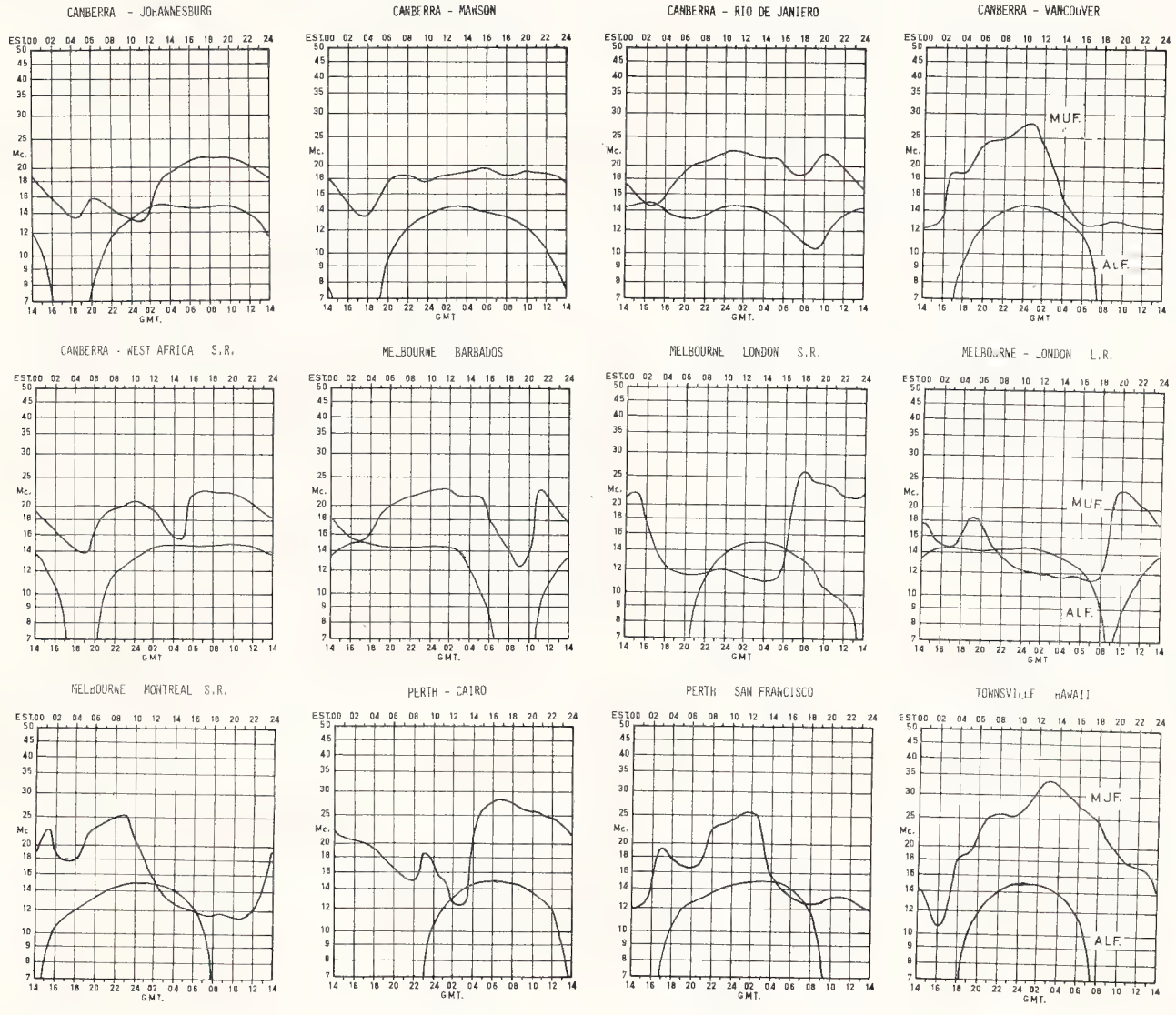
"A few days after we arrived back in this country on 4th May, 1971, I was preparing to get on the air with my old call sign G2KG (52 years old). I coupled up the rig in my bedroom with a 20 mx dipole coiled up on the floor and as the set warmed up there, without touching the dial, was VK3WW working a ZL4, with a signal from my old beam Q5 S0, but on the speaker."

Sad ending—the beam was smashed during the big blow in Melbourne on 3rd October.

—M. O'Burtill, VK3WW.

PREDICTION CHARTS FOR DECEMBER 1971

(Prediction Charts by courtesy of Ionospheric Prediction Service)



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Bandpass Filter at 455 KHz.
Input Impedance: 50 - 75 Ohms.
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Kit includes all Capacitors, Resistors, I.F's, Pots, Switches and 14 Transistors.
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DIVISIONAL NOTES

DIVISIONAL CALENDAR

3 Dec. VK2—V.h.f. meeting (Auction Night). Gosford meeting. Hunter Branch meeting.
VK5—V.h.f. Gp. meeting (equipment Display also).
5 Dec. VK3—V.h.f. Field Day (1100-1600).
VK5—V.h.f. Gp. Field Day (0630-1030, 1230-1530).
11 Dec. VK2—V.h.f. Christmas Party and Fox Hunt.
12 Dec. VK3—E. & Mt. Dist. R.C. Xmas Outing, Yarra Glen (all day).
14 Dec. VK5—Div. Xmas Social.
17 Dec. VK2—General meeting. Gosford meeting.

NEW SOUTH WALES

MEMBERSHIP APPLICATIONS

The following were presented to the General Meeting on Friday, 24/9/71: Mr. R. Atkinson, 29 MacDonnell St., Yarralumla, A.C.T., 2600, Assoc.; Mr. H. W. Buehler, C/o. Gulf Fisheries (N.G.), P.C. Box 920, Port Moresby, N.G., VK9HB; Mr. G. Dunkley, 8 Chambers St., East Maitland, 2323, VK2ZDR; Mr. D. Ford, School Residence, Austinmer, 2514, Assoc.; Mr. R. N. Tregea, 22 Trebor Rd., Pennant Hills, 2120, Assoc.; Taree OK Youth Radio Club, C/o. G. Hunziker, 26 Chatham Ave., Taree, 2430, VK-2BRC; Mr. V. Barker, 1 Rawson St., Epping, 2121, VK2ZVV/T; Mr. A. S. Brooks, 11 Hawthorne St., South Grafton, 2461, Assoc.; Mr. W. N. Bullivant, 1/122 Old South Head Rd., Bellevue Hill, 2023, VK2BC; Mr. E. C. Crouch, 5 Park Lane, Orange, 2800, VK2EC; Mr. L. R. Lawrence, P.O. Box 107, Kundiawa, T.P.N.G., Assoc.; Mr. S. G. Mudford, Roadside Mail Box 1, Georges Creek Roadside, Tallangatta, Vic., 3700, Assoc.; Mr. A. J. Skerrett, "Glen Alpine," Werris Creek, 2341, Assoc.; Mr. H. Willcoxson, 12 Tarana Cres., Baulkham Hills, 2153, Assoc.

Resignation: Mr. D. E. Vaughan, 3 Hampden Rd., Lakemba, 2195, VK2FY.

Transfer from an Associate to a Full Member: Mr. J. C. Young, 18 Vernon St., Hunters Hill, 2110, VK2ZJG.

LOAN OF F.M. BASE STATIONS

The following clubs have f.m. base stations on loan from W.I.C.E.N. for W.I.C.E.N. purposes: Orange Radio Club, Macquarie Radio Club, Blue Mountains Branch, Central Coast Branch, Hunter Branch, Maitland Radio Club, Nepean Radio Club, and recently the Armidale Police Boys' Radio Club and Taree OK Youth Radio Club.

The following clubs made application, but were unsuccessful: Westlakes Radio Club, Oxley Radio Club, and St. George Radio Society.

Please Note: No more applications as there is NO equipment left for distribution.

OXLEY REGION RADIO CLUB

A meeting was held on 3rd Oct. last by interested Amateurs from Port Macquarie and the surrunding area. It was decided to name the club the Oxley Region Radio Club. Peter Alexander was elected President and Owen Bested Secretary/Treasurer. One of the main objects of the club will be to encourage the use of v.h.f., particularly 146 MHz. The first steps in the immediate future will be to obtain the equipment to establish a repeater station. It is hoped that the locality of the repeater will be on the Middle Brother Mountain.

Henry VK2ZHE gave the meeting a run down on the method of obtaining equipment and the necessary permits. At present there are active stations on v.h.f. at Port Macquarie, Taree and Wauchope and the numbers will be steadily increased as others get their rigs going.

The following members attended the first meeting: VKs 2BGF, 2ZHE, 2ZIX, 2XVI, 2ZGC, 2AWS, 2PA, 2AEB and Bill Collinson, who has yet to get his call sign.

DX NEWS FROM VK2QL

For those who did not hear previous Sundays' broadcasts, it is suggested that you have a pencil and paper ready each Sunday so that, if you are interested in DXing, notes may be made of what is current on the bands.

ILLAWARRA BRANCH

Moonbounce Project.—Most of the work during Sept./Oct. was on site at Dapto. After the fans were placed in the tx cubicle the tx was installed and tests made through the repaired co-ax. feedline. As the rx pre-amp. was not operating, the tx feed was used to line up the dish again on sun noise. The chart recorder was forwarded to Roger VK2BRE to have it "debugged".

The tx was then operated into the dish feed and P.M.G. acceptance tests were carried out. Difficulty in achieving satisfactory stability from the oven controlled frequency source was overcome by placing it inside away from the breezes. The required stability of one part in ten million was then obtained and its frequency was adjusted to be within 50 Hertz at 432 MHz. The other P.M.G. requirements were checked out and were also satisfied. We are thus now cleared for operation by the P.M.G. and the 12 months extension of high power permit has also been granted.

The job of suitably coupling the tx frequency source into the rx input was then carried out to provide a reference tuning point on the i.f. channel rx at tx frequency.

Minor modifications to the tx metering circuitry, etc., were then completed and all tx and power supply chassis were labelled to designate all controls and functions. Roger VK2BRE has returned the chart recorder in excellent operating condition. We are now working on obtaining max. output from the tx into the dish feed and in getting the rx pre-amp. to operate satisfactory. Parts are also being obtained for a sighting telescope and photo-transistor unit to allow optical sighting of the dish on the sun and moon, to give accurate positioning of the main lobe of energy on the moon.

MORSE TAPE SERVICE

There is a Morse Tape Service available through the VK2 Division of the W.I.A. This service is available to anyone whether a member of the W.I.A. or not. The cost of this service is 30 cents per tape and the loan period is set at a maximum of two months. There is also a charge of 15 cents for tapes overdue over the two-month period. Payment of either amount preferred by either stamps or postal notes in favour of W.I.A. VK2 Division. To save time when applying, it would be appreciated if the following information could be supplied in the application:

(1) Name of tape recorder used,
(2) Number of tracks,
(3) Maximum size of tape spool used,
(4) Speeds at which it plays,
(5) Which tape shown in the list under you require. It is normal for only one tape to be supplied at a time.

The majority of the tapes available are on 5-in. spools two-track at a speed of 3¾ i.p.s. There are also some tapes on 3-in. spools at 3¾ and 1-7/8 i.p.s. Tapes available from the service are as under:

Beginners' special, 50 mins.
No. 1 ½ hr. 5 w.p.m. plus ½ hr. 6 w.p.m.
No. 2 ½ hr. 7 w.p.m. plus ½ hr. 8 w.p.m.
No. 3 ½ hr. 10 w.p.m. plus ½ hr. 11 w.p.m.
No. 4 ½ hr. 12 w.p.m. plus ½ hr. 14 w.p.m.
No. 5 ½ hr. 15 w.p.m. plus ½ hr. 16 w.p.m.
No. 6 ½ hr. 18 w.p.m.
No. 7 ½ hr. 20 w.p.m.

There are also several tapes available that consist of code groups rather than the plain language of the ones listed above.

For the supply of tapes or for further information contact the Morse Tape Supervisor, Mr. M. Francis, 93 Kingdon St., Scone, N.S.W., 2337.

VICTORIA

The summer season of sporadic E propagation is now open. Operators on 6, 10 and 11 metres are chasing the excellent interstate contacts which can be had using this form of propagation.

The Right Honourable Lord Casey, K.G., P.C., G.C.M.G., C.H., M.C., K.St.J., has consented to become the Patron of the Eastern and Mountain District Radio Club. Lord Casey has a very distinguished record of service to Australia. He served in many positions, both in Australia and overseas. He was Governor General of Australia for 3½ years from 1965 till 1969. Now in retirement, he still takes an active interest in many community activities.

News for inclusion in the Victoria Divisional Notes should be sent to the sub-editor, Gill Sones, at P.O. Box 36, East Melbourne. Remember these notes are based on the information supplied. If you want to see it in print, please send it in.

Merry Christmas and a Happy New Year from the Victorian Division.—VK3AUI.

EASTERN ZONE

The Eastern Zone held their annual convention at Mirboo North on 29th and 30th May. The office-bearers for 1971-72 voted in were: President, Lee De Vries, VK3AXM; Vice-Pres., Bruce Hockings, VK3ADB (ex-3ZWP); Sec., Gavin Kuch, VK3ZNC, P.O. Box 175, Maffra; Station Officer, David Scott, VK3DY (Zone station call sign VK3BEZ); Publicity Officer, George Francis, VK3ASV; Zone W.I.C.E.N. Co-ordinator, Harry Everett, VK3ZX; Zone Intruder Watcher, VK3ASV.

In the retiring President's report, Rodney VK3UG stated: "This Zone is steadily becoming the most active area in Victoria in nearly all facets of Amateur Radio. I say this with firm conviction that this is indeed true, and providing the enthusiasm shown by most of our members continues, our Zone will be widely known for its activities in the promotion of Amateur Radio in general . . ."

The Zone is running three successful A.O.L.C.P. classes, Warragul supervised by VK3UG, Traralgon by VK3BBB and VK3YEV, and Sale by VK3KR and VK3ZXM. In the August exam. we had seven passes, all now awaiting call signs. A Zone sub-committee was formed in 1970 to research into and make recommendations on the feasibility of a lower class of Amateur licensing. The final report was presented at the Eastern Zone general meeting at Traralgon on 31st July. This report was published in October "A.R."

The Zone held a further general meeting on Oct. 30 also at Traralgon. Amateur t.v. experiments in the 426 MHz. band took place at the Zone Convention and also at the Hobbies Exhibition held at Morwell on June 4 and 5. The t.v. consists of VK3BB/T, VK3YBI, VK-3ZXM and VK3ASV/T. VK3KR and VK3ABC are also experimenting with a.t.v. and also r.t.t.y. George VK3ASV of Morwell also carries out skeds using r.t.t.y. with Noel VK3NR of Melbourne using h.f. and v.h.f. 2 mx f.m. (146.584 MHz.).

SOUTH AUSTRALIA

With the changeover to summer standard time, the use of Greenwich Mean Time will save much confusion during the coming contests, although accepted band opening times will be askew.

The main activity during October was a visit to the Ceduna O.T.C. Earth Station organised by the V.h.f. Group to see the equipment and dish used to communicate overseas telegrams, phone calls and television programmes to the Intelsat III. satellite stationary over the Indian Ocean. The visit was a great success, both as a social outing and as a technical experience. About thirty Amateurs were present with about twenty friends and relatives using all acceptable modes of mechanised transport.

Visitors came from near and far, with Tony VK5ZAI from Bordertown the furthest and John VK5ZJB, one of our guides over the station, the nearest. Everyone really appreciated the intricacies of technology required to set up and maintain the station.

On the home front, further progress in finding a permanent home for VK5WI has been demonstrated by the committee actively investigating the few alternatives found. A conception of a technician licence requiring full theory and low Morse speed and operating from 21 MHz. upwards, together with an eventual lower limit of 144 MHz. for Limited licensees found favour with the October Divisional meeting. V.h.f. operators are worried about the clash of interests on 145.9 with the Australis satellite and repeaters and so there is plenty to talk about.

Our enthusiastic Short Wave Listener representative on Divisional Council, Tom Hannaford, could earn the Amateurs' undying gratitude by persuading his short wave listener enthusiasts to use their skills as listeners to man the Intruder Watch. Amateurs find many jobs in their hobby from aerials, construction, operating, and receiving, so listening can only be a small part of time available. S.w.l's with their listening expertise, and not spending time on construction or transmitting, will be able to pull their weight in the W.I.A., and really earn their spurs if they could perform this vitally necessary job of Intruder Watch. It is a long job, requiring definite receiving skills in identifying coded transmissions of teletype, facsimile and broadcast stations. My thoughts are with you Tom, and your counterparts in the other States. If S.w.l's can shoulder this load, the Amateur fraternity will be that much stronger.—VK5GZ.

— . . . —

W.I.A. 52 MHz. W.A.S. AWARD

New Members:

Cert. No.	Call	Additional Countries
97	VK7ZBY	1
98	VK7ZGJ	1

DX

Sub-Editor: DON GRANTLEY
P.O. Box 222, Penrith, N.S.W., 2750
(All times in GMT)

When I handed this column over to the Editor a few months ago little did I think it possible that I would be taking it over again within such a short space of time. Difficulties which existed at that time have been resolved, and I am very pleased to be back on the job once more. I enjoy compiling this column, and this in itself is a big factor in the successful handling of any task. It is my intention to gradually get away from the practice of gathering all my information from overseas news sheets where possible, and I will in future rely on reports and assistance from the VK gang, and my own listening.

A column of this nature can be divided into three essential features, reports of future events, identification of recent happenings, and information which will enable the reader to acquire his QSLs. Any information of this nature will be greatly appreciated, Box 222, Penrith, 2750, will find me, or a call to Springwood 511364 will do the trick.

In a recent newspaper article published in a Sydney week-end broadsheet, Amateur Radio got quite a lot of favourable publicity, however the main interest to the writer seemed to be a discourse on Alan Fairhall, and King Hussein. The writer, in passing, mentioned that it is possible to converse with people in all walks of life through the medium of Amateur Radio. This is very true, as this very brief list will show. At one stage, three of the Princes of Saudi Arabia were active using the calls HZ1AF, HZ1TA and HZ1SS. OE3AH is the call of Archduke Anton von Hapsburg, the Austrian pretender. UA1LO was the late Yuri Gargarin. Arthur K4LIB is radio personality Arthur Godfrey, WB6RER is held by Andy Devine, K0HWY and W1AYA were used by band leaders Tex Beneke and Pee Wee Hunt, Paul K6AK is Lawrence Welk's arranger, Kurt W2ZXM was the skipper of the ill-fated Flying Enterprise, and who is often heard operating maritime mobile. Several prominent U.S. diplomats, politicians and businessmen are active on the bands, also many of the world's social and religious leaders.

Next time you work a W who says "handle here is Charlie", dig into his background a little and you will find that he is one of Hollywood's best known character actors, or a prominent U.S. Senator. Many contacts would be far more interesting if a little more interest was taken in the person on the other end of the contact.

Band conditions at the time of writing are fair, the noise level is starting to creep up on 80 mx (but VK2QL lists many goodies on this band on s.s.b.). The DX on 40 over the opening weeks of October has been really good. The South American countries are still belting in on s.s.b. in the evenings, whilst the c.w. segment has been loaded. 20 metres has been livening up at around 1130z, and most times that I have checked 15 there has been a plentiful number of contacts available for the taking. As a matter of possible interest to those chaps who have been indulging in verbal and written conflict over the merits or otherwise of Novice licensing, have a look at 21100 to 21250 when the band is open, in fact do a little better, give them a shout, they will appreciate it at the same time it will give a true picture of Novice activity. I have not been watching 160 metres, however the word from the proverbial grapevine is that most of the G land boys who will be active during the summer will be chasing the VKs in the evenings on this band. If anybody doubts the possibility of G contacts on top band, I suggest he has a talk to George Allen over in VK6. George has the score on the board in regard to this most rewarding band.

W6FHM/DU1, currently active on 20 c.w., will be leaving that country for VQ9 where he should be operating from January to June 1972 after which date he returns to his home state.

Ed YA1GNT has been active daily on 14200 or thereabouts and asks for QSLs to be sent to YA1GNT, E. S. Popko, PAA/Kabul, Dept. of State, Washington, D.C., 20521, or direct to him at Box 279, Kabul, Afghanistan, this address may be used for all YA QSLs as the box is shared by the gang. OA8V contest station will be active till the year's end (s.s.b. all bands).

Overseas news pertaining to DX activity is broadcast by the Northern California DX Club every Sunday at 1800z and on Mondays at 0200z. The frequency is 14002, and this session is well worth listening out for if you want to be in the picture regarding current news. Also listen to Div. broadcasts, particularly VK2 (by VK2QL) and VK3 (by Harry Roach).

W3HNK can assist with QSLs from the following stations: UH8AE, UH8BG, UH8BO, UH-8CS, UI8CD, UJ8AC, UJ8AJ, UJ8KAA, and UK8MAA plus any UM8 station. Send your card with SASE or IRC to Joe's home QTH and allow several months for a reply. He asks that S.w.l's refrain from sending their reports through him, which is a fair request, in any case I have never had trouble with S.w.l. reports being answered from behind the iron curtain. I bundle them off about twice a year to Box 88, Moscow, and the replies eventually come through even if some of them are five years in so doing.

Nicaragua activities are maintained by YN-2OM and his XYL YN2CCN (14 MHz. s.s.b.) and YN3AAA (s.s.b. on 40 and 80).

Ceylon stations are once again on the air after being closed down from April 10 to Sept. 15.

SV0 stations still around are SV0WBB and WLL, both active from Crete, whilst SV0WE and SW0WUU are at it from Rhodes, Dodecanese Is. to be more precise.

Chagos with VQ9WES still active on 14 and 21 s.s.b.

There has been the usual spate of odd prefixes of late, some of these are from operations earlier this year, but nevertheless of interest. HU0A was a special call used by YS2CEN from El Salvador. HW6KAW was a special used by French club station F6KAW. O1IVR was OH1VR using a contest call. Most of the foregoing were used for contest purposes.

Call areas and allocations for PZ Surinam were made available recently. PZ1 Paramaribo and Surinane, PZ2 Nickerie, PZ3 Coronie, PZ4 Saramacca, PZ5 has been reserved for reciprocal licences, PZ6 Para, PZ7 Brokopondo, PZ8 Commewinje, PZ9 Marowijne and PZ0 has been reserved for special stations.

A memo here for the DX chasing S.w.l's. I am holding cards here for L2153, OK3UH/L2949, L2046, L2283, L2287 and SWL20851. If the holders of these numbers would send me their mailing addresses I would be delighted to forward their cards on. Any VK2 S.w.l's who are expecting cards to be returned via the Bureau should drop me a line with their address so that I can expedite the delivery of their QSLs.

The ID stations I1BGJ/ID and I1BUP/ID which were active earlier this year can be reached at C.P. 20, 14100 Asti, Italy. The suffix counts as for Italy, whilst the IE stations which were active a little while ago count as Sicily, for those societies who class the latter as a separate country. The QSL address for IE1PUG, IC1PUG and IC1AA is Box 143, Palermo.

U.S. Samoa is still well represented with KS6DR, DT and DX still appearing in the lists of calls worked. In each case they can be reached C/o. Dept. of Education, Pago Pago, U.S. Samoa 96920, Pacific Ocean.

BY1AB and BY3NK have been consistently heard and worked, the former on c.w., the latter on s.s.b., however there is a very strong feeling amongst the chaps in the Far East that both are pirates, as is possibly the case with BV2A. I would be pleased to hear from anybody who has worked either of these calls and has the QSL card back. There is a tendency amongst writers to brand as a pirate anything which to them seems a little out of the ordinary and in many cases they are right, however it would be interesting to know for sure if the stations they name as pirates are in fact well and truly licensed.

9X5 stations which still crop up are Al 9X5VA, who has been on 21 MHz., QSL to Box 30, Butare; 9X5CC, B.P. 61, Nyanza, Rwanda; 9X5SP, QSL to DL8OA, and 9X5AA whose manager is W1YRC.

4W1AF provides mainly week-end activity from Yemen, s.s.b. on 14 to 28 MHz. bands.

AWARD

A note to hand here re the Thunder Bay Award, this is available to any licensed Amateur who has worked five stations in Thunder Bay since Jan 1, 1970, the date of amalgamation of Pt. Arthur and Fort William. GCR list plus a dollar to Awards Committee, Box 571, Station "P", Thunder Bay, Ontario, Canada. VE3ARN, AVS, DP, EDG, EEF and HU are possible contacts. The award is available to S.w.l's on a heard basis also.

Arabian Nights Certificate.—10 Arab countries including JY.

Persian Empire Award—5 different EP stations (including 9C9DX) contacts in the year to 21/3/72. Five IRCs and log certified by two licensed Amateurs to Am. Rad. Soc. of Iran, Box 1000, A.P.O., New York, N.Y. 09205, U.S.A. ("CQ" Oct.)

QTH SECTION

A2CAD—Box 310, Gaberones, Botswana, Africa.
A2CAH—Box 17, Gaberones, Africa.
CR4BS—Box 101, Praia, Cape Verde Is.
CR3VV—C.P. 306, Bissau, Portuguese Guinea, West Africa.
EA9EJ—Justo Benedicto P., Calle Madrid, Aaiun, Spanish Sahara.
EA9AI—Angel Mora Garcia, Ejercito Espanol 1, Melilla.
ET3ZU—Box 379, Asmara, Ethiopa.
FP8CT—Laurent Briand, B.P. 347, St. Pierre, St. Pierre and Miquelon.
FR7AF—Michel Piolet, B.O. 207, St. Denis, Reunion Is.
FR7AG—Francois Pepin, B.P. 819, St. Denis, Reunion Is.
FR7AH—Claude Nerac, B.O. 819, St. Denis, Reunion Is.
FR7AI—B.P. 4, St. Clotilde, Reunion Is., Indian Ocean.
HS0ISB—Box 2008, Bangkok, Thailand.
KC6LG—Box 156, Yap, West Caroline Is., 96943, Pacific Ocean.
KG4CS—P.O. Box 34, F.P.O., N.Y., 09593, U.S.
KX6IP—Box 1474, A.P.O., San Francisco, Calif., 96555.
MP4BIJ—Box 144, Bahrain Is., Arabian Gulf.
PJ2HT—Box 879, Curacao, Netherlands Antilles.
PZ2AB—Box 71, Nickerie, Suriname, South America.
SZ0BR—Box 814, Athens, Greece.
TL8GL—Box 704, Bangui, C. Afr. Rep (or VE2DCY).
VQ9W—Box 234, Victoria, Mahe, Seychelles Is., Indian Ocean.
WC4SFF—Box 461, Lake Worth, Florida, 33460, U.S.A.
ZD3K—Box 504, Bathurst, Gambia, Africa.
ZD7BB—Box 17, Jamestown, St. Helena, Sth. Atlantic Ocean.
5R8AP—B.P. 3242, Tananarive, Malagasay Republic, Africa.

QSL MANAGERS

CT2BB via WA3NRV
CT2AJ via VE7BWG
CN8DW via W6GZI
CE0AE via WA3HUP
DL2AA via DJ9ZB
EA6BT via DL7FT
F0ZN via DJ9ZB
FY7YR via VE3BYN
FG0MH via WB8ABN
FG0NH via WB8ABN
GC5AWQ via DJ5PN
GM6UW/P via G6UW
HS3AET via K0VIF
HB0XJV via HB9AQL
HB0AZ via HB9AQL
HU0A via WA8DTY
HW6KAW via F6KAW
JW5NM via LA7RB
JX2HK via LA2HK
JY9AA, JY9AB, JY1, JY1/B, JY2 } WA3HUP
MP4TDT via DJ9WY
MP4BLV via W3BMV
OA8V via W9GFF
VQ9WES via WA3OTV
YN3AAA via DL3OH
4W1AF via DJ9ZB

QSL information (courtesy DOTM Bull. 3/71, VK2AXK, VK4KX, VK4UC, "73" July, VK6 Bulletin):

AC5TY—K3RLY (c.w. & s.s.b. on 14, 1200z).
IP1MOL, RB, RBJ—DOTM (W2GHK, Box 7388, Newark, N.J. 07107).
JD1ACF (Bonin)—JA1OAF.
KC6BK—Box C, Ponape, E. Car.
KF4SJ (KP4-Aug./Dec.)—DOTM.
MP4BJG—Box 144, Bahrein.
PJ7VL—Now DOTM.
VA2UN (McGill Univ. Montreal, Jul./Dec.)—DOTM.
VE1ASJ—Now DOTM.
VE7IR/XU—VE7BWG.
VP2AAA—W4DQS.
VR5LT—VK6WT.
XE1IIJ—DOTM.
ZS3KC—K4TXJ.
3F1IE (Panama)—DOTM (as HP1IE "awaiting logs").
7Q7AA—K4CDZ.
9H1BG—30 St. Dominic St., Attard, Malta (s.s.b. 14 MHz.).

That is about all I have for this month. I look forward to hearing from anybody who has an item of news, and this month I acknowledge assistance from the Long Is. DX Assn. and the ISWL (with late additions from VK2QL—Ed.) 73, de Don L2022.

STOP PRESS Announcement
V.H.F. COMMUNICATIONS
New Subscription rates for one year's issues:
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FEDERAL EXECUTIVE PUBLICATIONS

VHF

Sub-Editor: ERIC JAMIESON, VK5LP
Forreston, South Australia, 5233.

Closing date for copy 30th of month.
Times: Eastern Summer (Daylight Saving) Time.

AMATEUR BAND BEACONS

VK0	52.525	VK0MX, Mawson.
	53.032	VK0TM, Macquarie Island.
	53.544	VK0PF, Casey.
VK3	144.700	VK3VE, Vermont.
VK4	144.390	VK4VV, 107m. W. of Brisbane.
VK5	53.000	VK5VF, Mt. Lofty.
	144.800	VK5VF, Mt. Lofty.
VK6	52.006	VK6VF, Bickley.
	52.900	VK6TS, Carnarvon.
	144.500	VK6VE, Mt. Barker.
	145.010	VK6VF, Bickley.
VK7	144.900	VK7VF, Devonport.
VK9	144.600	VK9XI, Christmas Island.
ZL1	145.100	ZL1VHF, Auckland.
ZL2	145.200	ZL2VHF, Wellington.
ZL3	145.300	ZL3VHF, Christchurch.
ZL4	145.400	ZL4VHF, Dunedin.
JA	51.995	JA1IGY, Japan.
W	50.091	WB6KAP, U.S.A.
HL	50.100	HL9WI, South Korea.
ZK	50.100	ZK1AA, Cook Island.
KH6	50.101	KH6EQI, Hawaii.
	50.015	KH6ERU, Hawaii.

Additions this month to the beacons list is that of another in New Zealand, ZL4VHF at Dunedin on 145.400 MHz. Additional beacons are planned, including ZL1VHW for Hamilton, in the Waikato area, and ZL3VHT for Timaru. First commissioned area beacons outside the main centres will be 50 KHz. above the main centre area beacon.

Leigh VK6WA/T in a short letter confirms the existence of a beacon at Mawson, VK0MX, on 52.525, mode c.w., running 40 watts output, and beamed at Casey Base, which is roughly the same heading as for VK3. The beacon at Casey, VK0PF on 53.544 MHz. is beamed at VK, and runs 80 to 100 watts of c.w. Additionally there is another beacon at Casey beamed on Mawson, running about 15 watts, frequency approx. 52 MHz. So, on the basis of proposed activity in the Antarctica area, one could do well in keeping an ear and beam pointing South this DX season. It must surely be only a matter of time before someone makes a contact to the boys down there.

I was very pleased to receive a letter from Stan ZL4MB, of Dunedin, this month. Stan outlines the activity proposed for ZL4, which should arouse the interest of readers anxious to make contact with this rare area. Stan reports he has a 100w. a.m. final in the testing stages, and an RF26 unit for basic reception, and expects to complete a suitable two-stage pre-amp., possibly E88CC, etc., to go ahead of this. He has completed one 5-element yagi on a 15-ft. boom and is building another so they can be stacked. Limitations at his end are that their Channel 2 t.v. operates 54 to 61 MHz., usually from 2 to 11 p.m. (Dunedin time daily). However, Stan will be looking for VK contacts from about December to end of January, mostly at week-ends. He proposes transmitting outside t.v. hours, which means VK stations should look for him prior to his 2 p.m. (1300 Eastern Summer Time). After that he is prepared to call on 20 or 40 metres if some suitable frequency can be nominated for VK stations on which to listen. Thank you, Stan, for that very welcome bit of information, you can be assured to plenty of efforts to work you, there must be scores of stations in Australia wanting that ZL4 area for W.A.Z.L. Certificate.

Bob VK6BE is now in Albany and has been spending some time upgrading the beacon transmitters there. Advice comes from the W.A. V.h.f. Group News Bulletin to the effect that it has been proposed installing a second beacon in the VK6VE cabinet, operating on 52.950 MHz. To minimise running expenses it has been suggested that a limited time schedule be adopted, and also that power be reduced, but using better aerials to give an equal e.r.p. Speaking with Bob one night on 80 metres, he further emphasised this point, that the Albany Group is comprised of only a few members, and some quite reasonable costs have been born by the Group, and their finances are definitely being strained in trying to keep beacons on the air. Running costs alone for the present 2 mx beacon are above $40 p.a., and with two beacons this would rise to above $70 p.a. Bearing this in mind, and remembering that the Albany 2 mx beacon has been responsible for some 70 stations working VK6 on 144 MHz., and this number will rise as time goes on, there may be groups to the east of VK6, principally in VK5 and VK3 as the main recipients of the Albany signals, who would be prepared to give some little help on an annual basis to keep this and either a 52 MHz. or ultimately a 432 MHz. beacon active.

Normally I would feel such matters were purely a Divisional one, and possibly some help could be forthcoming from the VK6 W.I.A. Division, the side benefits to the Eastern States is so great in this case, due to ducting and inversions which follow the coast line, that there could be valid reasons for some help in this case. Perhaps the matter could be discussed in the two States mentioned, and possibly VK7. Any action taken could be directed towards Bob VK6BE.

A copy of "QRM" has arrived on my desk. This is published by the Northern Zone of the W.I.A. in VK7. I thank those responsible for sending it. Contained therein is mention of the sale of the equipment of Len VK7BQ, who is Patron and Life Member of the Tasmanian Division of the W.I.A. Len recently made a big decision, that at 81 years, he should retire from Amateur Radio. He commenced operation in 1925, on 200 metres, progressing through time to the early days of 50 MHz., then followed by 144 and 432 MHz., and later f.m. gear. Many VK and ZL stations will recall working Len on 50 or 52 MHz., and possibly other bands, so we do feel sorry to lose such a champion of the cause. However, the last paragraph on the subject in "QRM" shows chivalry has not been entirely lost, and bears quoting: ". . . the sum of $250 was raised. For some reason or other some gear still remained in the shack, together with the QSLs on the wall reminding us of days gone by. Strangely enough, this gear included a 40 mx transmitter, a modulator and associated power supplies, so you haven't heard the last of 7BQ yet, which goes to show you how wrong we were." So Len will still be able to keep some contact with his son John VK3AAC. We wish you good luck Len, for your remaining years, from the readers of "Amateur Radio".

PROJECT AUSTRALIS

Group discussions will be going on now on the subject of Australian repeater frequencies in relation to Project Australis A-O-B satellite frequencies. To bring you into the picture a little more, as this may be the first time you have read the frequencies (courtesy of VK2 V.h.f. and T.v. Group Newsletter):—

(a) VK Translator System (in MHz.):
Uplink: 145.800, 145.850, 145.900, 145.950.
Downlink: 435.100, 435.150, 435.200, 435.250.
(b) DJ Translator:
Uplink: Between 432.125 and 432.175 MHz.
Downlink: 145.900 MHz.
(c) Amsat Translator:
Uplink: 145.900 MHz.
Downlink: 29.500 MHz.

The Australia-wide f.m. repeater and simplex channels in the 2 mx band are:—

Repeaters:	IN	OUT
Channel 1:	146.1	145.6 Secondary
,, 2:	146.2	145.7 Future
,, 3:	146.3	145.8 Future
,, 4:	146.4	145.9 Primary
,, A:	145.854	
,, B:	146.000	Primary
,, C:	146.146	

Three possible solutions to these frequency conflicts proposed by the Australis Group are: (a) Changing the satellite channels, (b) Changing the VK repeater channel frequencies, and (c) Turning off the VK repeaters during each pass of the satellite. To add to the turmoil, the satellite frequencies are an optimisation of frequency conflicts all over the world. I have not before said much about repeaters and satellites in this column, as they are generally handled adequately in separate articles by those more directly concerned, but I know there are many who have not done their homework and followed these problems as presented before, so perhaps this limited outline of the situation presented right in the middle of your notes will enliven your interest.

DX CALLING FREQUENCIES

From time to time I am asked about the establishment of DX calling frequencies, and usually advise that 52.010 MHz. seems to be fairly well established for such operation. As some stations have used it successfully for meteor scatter operation, there does not seem a need for another frequency. Therefore, I see no need at present to vary my answer, let us make 52.010 a DX calling frequency, but don't hog it, once contact has been made, shift up or down a few KHz. and leave the channel free for some other area to be heard.

Another point in favour of 52.010 is that it is only 10 KHz. from 52.000, a point easy to establish accurately using a 1 MHz. crystal carefully set up. In this way, providing you have stable equipment, you should be able to monitor the calling frequency when in the shack doing other things.

The whole idea is particularly well suited for s.s.b. operators and their transceivers. Similarly, if you are in the shack and not actually operating, your receivers should be listening on some part of some band, if not the above mentioned DX calling frequency, then at least on some beacon frequency, the time of day and conditions will dictate to a certain extent where you ought to be listening. Don't forget also, more than one receiver can use one converter at the same time, feed the output of the converter into two or more receivers and set them on different places, if something comes up you will hear it!

And still on the subject of calling frequencies, remember that 14130 KHz. is the International v.h.f. liaison frequency, a call there may surprise you who answers sometimes. (Reminder also that 7050 KHz. is a VK calling frequency.—Ed.)

VK3 V.H.F. GROUP TROPHY

Congratulations to Ron VK3AKC, who was awarded the above trophy for 1971 for his efforts in breaking the Australian 1296 MHz. record by working VK7ZAH in Launceston, achieved after months of experiments at both ends. Ron was presented with an inscribed microphone at the Gembrook Rally on 19th September, by the Chairman of the V.h.f. Group, Gil VK3AUI.

Bob VK3AOT sends along his usual interesting notes and the following are extracts from them: "Two metre activity in Melbourne is at its highest level for probably four years, many being well aware of the potentialities of VK6 DX, and much upgrading of equipment has been going on through the winter months. Six metres also has been going ahead, despite t.v.i. possibilities, and up to 15 stations can be heard on Sunday mornings following the broadcasts.

"Quite a lot of v.h.f. activity is planned from ZL this season. David ZL4PG and Bernie ZL-4IS intend operating portable on a 5000-ft. mountain on dates coinciding with the VK3 Field Days. They will use 51.0 to 51.5 s.s.b., 52.005 a.m., 2 metres a.m. and s.s.b., and 432 s.s.b., with 80 metres s.s.b. for liaison. ZL4PG operates 52.005 with 100 watts of a.m. most week-ends beaming VK. Times are 0900 to 1130.

"The VK3 Eastern Zone 2 mx beacon construction is nearly completed, tentative frequency until some national beacon plan is adopted will be 144.450 MHz. Launceston are thinking about a beacon, also Mt. Gambier and Sydney.

"Recently a group of Amateurs in Wollongong, N.S.W., conducted 432 MHz. moonbounce tests with K3MYC but results so far are not known. (Those concerned might let me have some information please—5LP.)

"The VK3 V.h.f. Group has decided to publicise a list of suggested beam headings for use by Melbourne 2 mx stations during periods of unknown conditions. If the more distant stations were to beam towards Melbourne at the appropriate time for their area more contacts may result. The suggested areas and times are: Gippsland 1930, Tasmania 2000, Ballarat and Adelaide 2030, Western Victoria and Mt. Gambier 2100, Northern Victoria 2130 and North-Eastern Victoria 2200." (This sounds reasonable and could well produce interesting results.—5LP.) Thanks Bob for your continued interest.

The week-end of 4th and 5th December will be a good one for v.h.f. operation. Field days are being conducted in VK3 and VK5 and in New Zealand as well, and there is reason to believe there will be quite a few stations operating portable in all areas. VK5 portable stations are most likely to be set up and operating on the Saturday night in readiness for a good start at 0730 Sunday morning. The one hour of daylight saving is going to help DX operating in the mornings this year, in effect giving an additional hour of operating before conditions fade out.

The last week-end of October saw the sweeping in of a nice big inversion across the southern part of Australia to produce some excellent 144 and 432 MHz$. DX. Tony VK5ZDY from his prime location at Stirling in the Mt. Lofty Ranges made the most of it, working on 144 VK3s NS, ZOO, ZSB, AKC, JS, AKR, BDA, ZUR and AOT. Not content with that, he turned his attention to 432 MHz. and had 5 x 9 contacts with Ron VK3AKC, Bob VK3AOT and Dennis VK3BDA. Jim VK3YDJ and Les VK3ZUR also heard Tony on 432 but were unable to make contact. Jack VK3NS also heard Tony at 5 x 9, but I understand he has no transmitter. While all this was going on in an easterly direction, things were also happening to the west, with Kerry VK5SU at Ceduna putting in a 5 x 9 signal

(Continued on Page 21)

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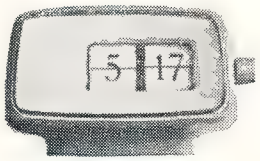

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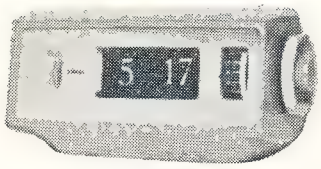

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VHF NOTES

(Continued from Page 19)

to Adelaide. Bob VK5ZDX even worked Kerry on 6 mx as well, but signals were considerably weaker than on 2 mx. Others getting in on this two-way activity east and west included Mick VK5ZDR, Noel VK5VT, John VK5QZ and Jim VK5ZMJ. Much gnashing of teeth went on in my shack as the inversion did not reach the 30 miles inland to my location, and I had to content myself with one solitary b.f.o. note from VK5SU and a very weak signal from VK3AOT, no contacts made, not a sound from any other station, but that's the selective pattern of these openings, and there was nothing I could do about it!

TWO YEARS OF OPERATION

That's right. That's the length of time I have been trying to keep you filled in on some of the v.h.f. news of Australia. It has not been easy and still isn't. It takes a lot of time and much reading and sifting of material has to be done before copy can be prepared for "A.R." I am indeed grateful to a few regular contributors, particularly Bob VK3AOT, who is there every month with something, what a pal! I thank those people responsible for the various bulletins and magazines I receive from different V.h.f. Groups, etc., throughout the country. Currently I receive one or more such news mediums from VKs 2, 3, 4, 6 and 7 plus "Break-In".

If you feel your particular State has not been getting much written about it of late, then the answer is simple, no one writes to me! I do not undertake to give replies to letters unless specifically requested for information, time is too limited, but all sources of information are acknowledged each month in "A.R." as the particular paragraphs are prepared. The "Meet the Other Man" series has been temporarily discontinued due to difficulty of getting those contacted to write with information on the pro forma supplied. I will get it going again soon.

I would like to thank the Editor of "A.R." for his overall co-operation and understanding. He hasn't been too hard with the blue pencil, although a couple of times I have not agreed with him! However, after a month has passed by, time mellows one's thoughts and we proceed as before.

I will try and keep the page going for the time being. Constructive suggestions for improvements are always welcome, news items are ALWAYS welcome, but bear in mind I may not be able to include all you send, particularly if not of a national nature—this is where the Editor's blue pencil comes in!!

Please note all times (as indicated at top of page) are now daylight saving time as related to Eastern Standard Time, and will remain this way until the March issue. Where a particular reference has to be made to time it will be referred to as "Eastern Summer Time".

Seasons greetings to you all for Christmas and the New Year.

The thought for the month: "Only he who attempts the ridiculous can achieve the impossible." 73, Eric VK5LP, The Voice in the Hills.

— · · · —

LINCTUS SYNAPSIOSAE
or Little Morsels

A receiver capable of detecting these transmissions need only consist of a pair of headphones connected to two earth rods separated by as great a distance as possible. (Rad. Comm. Dec. 70—1 KHz.)

They would not care to see c.w. waltz ("73," Mar. '71).

Drew particular attention to the development of the ultra-high frequencies and television which was the job of the Amateur today. (T. & R. Bull., Jan. 1932).

Two years ago I took a trip to Latin America. I had written to every Amateur Radio Association in the countries I was going to visit, giving them the exact date and time of my arrival, flight number, hotels where I would stay and I explained that I would like to meet with local Amateurs. I did not get one single (phone) call from them during the entire trip. However, I did manage to meet local Amateurs on my own. (WB2AQC, Reception Centre for Foreign Amateurs visiting New York City, May 1971).

The use of voluntary services by thousands of individuals (Amateurs) on a world-wide basis provides a service to humanity in the advancement of scientific knowledge that cannot be matched by any single country (W.A.R.C. Geneva 1971, extract from U.K. Doc. 315).

The rapid growth of f.m. is beginning to catch up with us. In most major metropolitan centres 146 to 147 MHz. is full with repeaters and simplex operation; the top 10 MHz. of the 450 band is full with repeaters, simplex, uplinks, down-links, and various control functions; 6 mx is rapidly filling up in non-channel 2 areas (FM in "CQ" Oct. '71).

It is a curious fact that one of the longest standing unsolved riddles in this field (radio astronomy) is commonly studied with a simple h.f. yagi ("73" Aug. '71, in relation to the powerful sporadic radio emissions from, or near, the planet Jupiter, in the spectrum around 15 to 30 MHz.).

—H. F. Evertick.

Photograph taken at Ockley Radio Club, Narrogin, Western Australia, on 3rd October to mark the visit of the Federal President, VK3KI (standing, with glasses). Operating mobile was Percy Beacher, VK6DD, Vice-President of the VK6 Division, who drove Michael around. (Block courtesy "Narrogin Observer")

OBITUARY

DUDLEY NOURSE, VK2DQ

The key of Dudley Nourse is now and for ever silent. What kind of a man was VK2DQ? He was an exponent of the art of c.w., shorthand and typing.

He was a pioneer of s.s.b. and with home-constructed gear was an original member of the 80 metre "Sewing Circle".

Ever willing to assist others, his cheery voice full of "sky-larking" could be heard on 80 most evenings—only those who were close to him realised the tremendous suffering his war injuries caused him. I considered him a close personal friend and deeply regret his sudden passing.

Although his key is now silent, I'll wager he can hear us on u.s.b. and will some day p.t.t. again when we finally net in on his frequency.

To his XYL Jean and harmonic Pam, I extend on behalf of those who knew him deep and sincere sympathy.

73 Dudley, CU further down the log.—VK5XB.

ANDREW JOHN WRIGGLESWORTH VK2BKW

Andrew's mother writes from Bangalow that he was only 25 years old when he died on 23rd September, and had always been keenly interested in radio and was a member of the W.I.A.

He had little time free for transmitting, but had collected W.A.C. after constructing his own transmitting and receiving equipment, all of which had been done in spare time when firstly at university, from which he graduated with honours in physics, and latterly when he was at home.

We offer sincere condolences to Mrs. E. J. Wrigglesworth and to all who had been associated with Andrew.

PILE-UPS ON 435?

With the continuing progress on A-O-B, and the good prospects for SYNCART and SKY-LARC, it looks like we will soon have several new DX bands. Unfortunately, different and more sophisticated equipment is needed to work DX at v.h.f./u.h.f.; so, we probably won't see that many stations on the satellite repeater channels for a while.

If we get SYNCART working, though, the word will get around pretty quick about the new band. One might speculate: How long until we see the first "pile-up" trying to work a rare DX station? What rules of courtesy do we observe? Will the old DX pile-up problems re-appear in the v.h.f. bands? In satellite relay links, high power and high gain antennas are even more of an advantage than at h.f. Will the first satellite-relay DXCC award automatically go to the Amateur who is first able to put a kilowatt into a 30-foot parabolic dish?

The answers to these questions are not in anyone's hip pocket. Some problems, like strong signal "capture" of the satellite repeater, might be eliminated in future design. Others, like the problem of wideband Amateur t.v. and satellite channels on the same frequency, require tact and understanding on everyone's part. Some problems, like the crank who wants to use his transmitter to hurt everyone else, will probably never go away.

The stakes that ride on a solution to our problems are higher in the satellite game than they were at h.f. At the Space Conference, we were given notice that our performance on 435 will be looked at carefully. Our ability to get new bands for space links, and to retain what we have now, depends on how well we can solve these problems.

—WB4SMH in "Amsat Newsletter, Sept. '71.

NEW CALL SIGNS

AUGUST 1971

VK1DS—P. A. Smith, 6 Rowell Pl., Weston, 2600.
VK1CAA—W. O. B. Wilson, Youth Hostel, Dryandra St., O'Connor, 2601.
VK2SO—W. F. Noble, 23 Isabel St., Belmore, 2192.
VK2BAA—Armidale Police Citizens' Radio Club, Rusden St., Armidale, 2350.
VK2ZTR—R. T. Tinker, R.M.B. 1263, Lancelot St., Blacktown, 2148.
VK3PM—G. S. V. Frew, 13 Wellington St., Middle Brighton, 3186.
VK3YV/T—D. K. W. Bradbury, 1 Shrimpton Crt., Box Hill North, 3129.
VK3ABM—W. Porter, 1 Heyington Pl., Toorak, 3142.
VK3AHC—H. N. Charles, 3/22 Wallace Ave., Toorak, 3142.
VK3AJU H. Jupp, 20 Webster St., Dandenong, 3175.
VK3BFT—Collingwood Technical College, 35-41 Johnston St., Collingwood, 3066.
VK3YCO—S. L. Morgan, 8 Nelson St., Bendigo East, 3550.
VK3YGC/T—R. C. Corrigan, 3 Valewood Dr., Mulgrave, 3170.
VK3ZHC—J. D. Mathieson, 3 Cherry Rd., Balwyn, 3103.
VK4AD—A. W. Eklund, C/o. J. McWhirter, 52 Queens Rd., Clayfield, 4011.
VK4SE—S. S. St. George, 2 Aspect St., Toowoomba, 4350.
VK4WA—A. E. Watkins, 1/21 Lever St., Albion, 4010.
VK4ZJL—J. C. Mounsey, 343 Rockonia Rd., North Rockhampton, 4700.
VK5UP—R. L. Parnell, 23 Margaret St., Port Augusta, 5700.
VK5UQ—J. A. Cooper, 19 Charles St., Norwood, 5067.
VK5ZET/T—E. R. Tuohy, 30 Malvern Ave., Malvern, 5061.
VK6HN—A. T. G. Hanson, 121 Rosebery St., Inglewood, 6052.
VK6NY—M. B. Bertram, Station: Portable; Postal: C/o. Allied Minerals N.L., 283 Rokeby Rd., Subiaco, 6008.
VK6RV—R. G. B. Vaughan, 12 Munyard Way, Morley, 6062.
VK7JU—M. G. Burleigh, 12 Benjamin St., Launceston, 7250.
VK8VV/T—B. J. Clarke, P.O. Box 171, Katherine, 5780.
VK8ZDH—D. R. Hockley, 2354 Britomart Gardens, Alawa, 5790.

ALTERATIONS

VK1ZVT/T—D. S. Thomas, 2/47 Hampton St., Yarralumla, 2600.
VK2BV—Waverley Radio Club, 49 Old Bush Rd., Engadine, 2233.
VK2KR—K. C. Mattei, 31 Putarri Ave., St. Ives, 2075.
VK2LI—M. P. Moore, 21 Avoca St., Randwick, 2031.
VK2ABE—A. J. Forbes, 39 Flood St., Bondi, 2026.
VK2ABS—B. S. Sullivan, 186 Kilaben Bay Rd., Kilaben Bay, 2283.
VK2ANO—J. A. Simenson, 6 Koorabel Ave., West Wollongong, 2500.
VK2ANZ—C. S. Smith, 244 Bacon St., Grafton, 2460.
VK2ASU—H. S. King, 29 Coutman St., West Kempsey, 2440.
VK2ATZ—Westlakes Radio Club, Anzac Pde., Teralba, 2284.
VK2BGV—G. Voron, 60B Dutruc St., Randwick, 2031.
VK2BHJ—H. J. Town, 37 Numa Rd., North Ryde, 2113.
VK2BTB—T. S. Barnett, Lot C, Mt. Keira Rd., Wilton, 2571.
VK2CAS—A. G. Svensen (Sqn. Ldr.), Lot 25, Reid Rd., North Springwood, 2777.
VK2ZFX/T—R. F. W. Boundy, Lot 20, Hickey St., Ballina, 2478.
VK2ZFY—A. E. Kent, Lot 386, Thirroul Rd., Kanahooka Pt., 2530.
VK2ZHE—H. D. Lundell, 10 Tyron St., Chatswood, 2067.
VK2ZHM –J. H. Mitchell, Lot 259, Bannister Head Rd., Mollymook, 2539.
VK2ZIP—R. H. Smith, 162 Pacific H'way, St. Leonards, 2065.
VK2ZIZ—H. P. Robinson, 8/16A Meadow Cres., Meadowbank, 2114.
VK2ZUI/T—R. Ecclestone. Addition of /T.
VK3CY—C. Yeoman, 4/44-48 Durrant St., Nth. Brighton, 3186.
VK3VH—D. H. Sinclair, 9/42 Clark St., Port Melbourne, 3207.
VK3YP—W. H. Payne, 3 Harrow Crt., Doncaster, 3108.
VK3ABG—J. A. G. Miller, 554 Malvern Rd., Prahran, 3181.
VK3AGW/T—A. G. Wilkey, Station: Upper Mt. Morton Rd., Belgrave Heights, 3160; Postal: P.O. Box 106, Oakleigh, 3166.
VK3ARB—R. A. Bourchier, 11A Hall St., Moonee Ponds, 3039.
VK3BBI—B. Lukes (name amended), 48 Pennell Ave., St. Albans, 3021.
VK3YDT/T—J. W. Whitehead. Addition of /T.
VK3ZAU—I. J. Zmood, 1 Wrixon Ave., East Brighton, 3187.
VK3ZCY—J. H. Ely, 12/27 Ewart St., Malvern, 3144.
VK3ZKO/T—R. J. Broughton. Addition of /T.
VK3ZLS—G. R. Forman, 8 Comrie Crt., Bayswater, 3153.
VK3ZOG—P. G. M. Bruer, 21/49 Walsh St., South Yarra, 3141.
VK3ZSN/T—W. Chandler. Addition of /T.
VK3ZXA—D. Mitchell, 17/48 Lansell Rd., Toorak, 3142.
VK3ZIH/T—R. S. Hernan. Addition of /T.
VK3ZPA/T—P. A. Wolfenden. Addition of /T.
VK4OF—K. P. P. O'Farrell, 37 Amsterdam St., Upper Mt. Gravatt, 4122.
VK4ZDS—D. A. Morrish, 2/34 Morshead St., Bundaberg, 4670.
VK5QA—F. T. Wilson, 7 Peroomba Ave., Kensington Gardens, 5068.
VK5XG—G. N. Antuar, 16 Pine St., Peterborough, 5422.
VK5ZCB—T. R. Friebe, 145 North St., Henley Beach, 5022.
VK5ZPR—P. R. Banks, 3 Park Tce., Enfield, 5085.
VK6BQ—R. R. C. Davies, Lot 10, Kawina Rd., Bickley, 6076.
VK6NF—N. F. Odgers, 18 Parnell Pde., Bassendean, 6054.
VK6NH—N. H. Hyde, 67 Hennessy Ave., Orelia, 6167.
VK6ZV—F. X. Lawlor, 12 Bellairs Rd., Kardinya, 6163.
VK6ZCE—C. Morey, 2 Clarendon St., Cottesloe, 6011.
VK6ZFH—G. C. F. Hufner, Station: "Mareeba," Albany H'way, Arthur River, 6315.
VK6ZGG—G. R. Gaiger, 26 McGill St., Kewdale, 6105.
VK7ZAE—A. R. Everts, 17 Gregory St., Sandy Bay, 7005.
VK7ZLH—R. L. Hibbert, 647 Huon Rd., Fern Tree, 7101.
VK7ZNS—N. Stutterd, 57 West Park Gr., Burnie, 7320.
VK8DO—D. O. White, 28 Mullen Gardens, Alawa, 5790.
VK9AD—J. R. Devereux, P.O. Box 846, Rabaul, N.G.
VK9BJ—B. J. Mennis, P.O. Box 706, Madang, N.G.
VK9VM—I. C. Fisher, P.O. Box 428, Port Moresby, P.

CANCELLATIONS

VK2AS—A. C. Freeman. Deceased.
VK2CL/T—L. H. Taylor. Not renewed.
VK2DU—D. R. W. Fullerton. Not renewed.
VK2EF—J. F. Small. Deceased.
VK2JZ—A. S. Mather. Deceased.
VK2NY—R. J. Berry. Not renewed.
VK2QP—L. W. Hughes. Deceased.
VK2VE—R. J. Cramer. Not renewed.
VK2WS—R. N. Sneddon. Deceased.
VK2YV—G. T. Littlefair. Deceased.
VK2AFZ—J. E. Johnson. Deceased.
VK2AIO—A. O. Brand. Not renewed.
VK2AJG—L. D. Sanders. Not renewed.
VK2AKB—W. F. Porter. Deceased.
VK2BBA—H. Schoning. Not renewed.
VK2BED—A. H. Bennett. Not renewed.
VK2BFB—F. B. Crum. Not renewed.
VK2BPA—N. G. Williams. Transferred to Qld.
VK2ZBE—R. J. Jarrett. Not renewed.
VK3JK—G. S. V. Frew. Now VK3PM.
VK3AII—E. W. Cleburne. Transferred to N.S.W.
VK3AVC—Caulfield Grammar School. Not renewed.
VK3BDK/T—D. K. W. Bradbury. Now VK-3YV/T.
VK3ZPE—J. R. Edwards. Not renewed.
VK3ZPY—R. J. Gowland. Not renewed.
VK4BF—W. F. Davidson. Not renewed.
VK4CM/T—T. M. B. Elliott. Not renewed.
VK4MK—M. T. K. Power. Not renewed.
VK4PE—Padua College Radio Club. Not renewed.
VK4WH—W. E. Hagarty. Not renewed.
VK4ZJG—J. G. H. Rowell. Not renewed.
VK5BA—Brompton Boys' Radio Club. Not renewed.
VK5HU—K. L. Gillion. Not renewed.
VK5MV—M. H. Winkler (Rev.). Not renewed.
VK5PD—J. H. Boucaut. Not renewed.
VK5WZ—F. G. Anear. Deceased.
VK5YC—K. C. Young. Not renewed.
VK5ZCL—P. T. Leathem. Not renewed.
VK5ZKZ—D. P. Ramsey. Transferred to Vic.
VK6FS—H. D. Spence. Not renewed.
VK7ZWD—D. Whent. Not renewed.
VK8JC—J. A. Cooper. Now VK5UQ.
VK9LM—L. G. Meek. Transferred to N.S.W.
VK9WB W. A. Bowles. Not renewed.

LICENSED AMATEURS IN VK

AUGUST 1971

	Full	Lim.	Total	
VK0	11	1	12	
VK1	88	30	118	
VK2	1419	496	1915	
VK3	1308	669	1977	
VK4	520	206	726	
VK5	515	226	741	
VK6	369	135	504	
VK7	156	65	221	
VK8	37	13	50	
VK9	84	11	95	
	4507	1852	6359	Grand Total

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An album of three Records produced with Ivan R. Hodder by the Flight Training Centre (Aust.) Pty. Ltd. Revolutionises the learning of Morse Code—all you need is the family Record Player!

The F.T.C. course has discarded the old, now outmoded system of learning the Morse Code by visual means alone. Those learning the Code by this method rarely progressed beyond five words per minute. This course is designed to teach aural recognition of the symbols—as the student will hear them in actual use.

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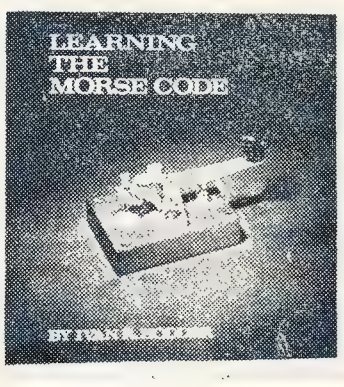

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SILENT KEYS

It is with deep regret that we record the passing of—

VK2DQ—D. Nourse
VK2BKW—A. J. Wrigglesworth
WIA-L30313—F. G. Flounders

RECIPROCAL LICENSING

The following is extracted from I.A.R.U. Region 1 News:—

The President,
Radio Society of East Africa,
P.O. Box 5681, Nairobi.

Dear Sir,

1. It would be very much appreciated if you could give the widest publicity possible in all the Amateur Radio magazines to the fact that all visitors to East Africa who are desirous of obtaining an East African call sign whilst on holiday should apply in writing in the first instance to:—

Engineer-in-Chief,
E.A. Posts and Telecomm. Corp.,
P.O. Box 7129,
Kampala,
Uganda
(For attention: "R.C. Section")

and should be prepared to submit a photostat copy of their current licence together with proof of a pass in a Morse test at 12 words per minute, or more. The application should be submitted at least three months before the intended visit, in order that the necessary clearance can be obtained from the respective Governments and should be accompanied by letters from two referees testifying the applicant's good character and interest in Amateur Radio.

2. Upon receipt of the application in this office, the necessary machinery will be set in motion. No guarantee of success of the application can be given, but every one received is dealt with equally.

3. It would also be appreciated if you could bring to the notice of all your members the contents of Clause 14 of the Amateur Radio Licence (EA) which states: "This licence shall be returned to the Director-General when it has expired or been revoked." This applies also to licensed Amateurs who have left East Africa permanently.

Thank you for your anticipated help and co-operation.

Yours faithfully,
(Signed) A. F. Ward,
for Engineer-in-Chief.

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by 9th December, 1971.

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OVERSEAS MAGAZINE INDEX

(1) "Break-In" Sept. Turn on that transistor; Designing an equalised pre-amplifier for stereo magnetic cartridges; Microwaves for the Amateur; Interesting facts for the s.h.f. man.

Articles which appear in other magazines are as follows:

Accessories: (3) R.f. Power Measurement with Hot-Carrier Diodes, IC/Photocell Compressor/AGC Unit; The Theft Stopper; Yet Another Code Monitor; The Spider, a gadget for the transceiver man with a following linear amp.; An IC Pulser for the Amateur Experimenter; A DC Isolator for Phones. (5) BK System using Reed Relays. (7) Another Transistor Tester; A General Purpose Solid State Pre-Amplifier. (8) FET Transconductance Tester.

Antennas: (4) Adjusting the Cubical Quad for Optimum Results. (5) Basics About Antennae, notes on the end fed and tuned doublet types. (8) 80 Metre Vertical Antenna.

General: (2) You can take it with you; Four Tube Station (c.w. on 40 and 80); All's Well in Amateur Radio; (3) Transformerless Power Supplies; A Marketing Man's Approach to Ham Radio. (3) Man-Made Interference, Its Causes and Cures; New Hope for Learning the Code. (7) Semiconductor Curve Tracer, Part 2. (2) DX-pedition to the Laccadives; Facsimile for the Radio Amateur, Part 1; Diary of a DX-pedition. (3) Facsimile for the Radio Amateur, Part 2. (4) Highveld goes to the lowveld; The Roof of Africa Rally. (7) Low Loss Passive Bandpass C.W. Filters; Review, Drake "Marker" Luxury F.M. Transceiver. (8) Photofabrication of PCB's; RTTY Automatic Frequency Control; IC Phase Locked Loops.

Receiving: (2) 15 Metre Signals from Jupiter; DX from the Stars. (7) 80-10 Metre FET Pre-Selector; 2 x MPF102s in a Cascode Circuit. (8) Multi-Mode I.F. System; Update that old Receiver for SSB, etc.

Transmitting: (2) Tiny Tim Linear Amplifier, 600w., 2 x 811A and an old t.v. transformer; Digital Readout for Your VFO. (3) Build a Solid State TV Camera; A Linear, Stable VFO with tracking mixer (use it in tx or rx applications). (4) An AM Final for Your SSB Transmitter. (5) Build up of a Transmitting Layout. (7) Custom Design and Construction Techniques for Linear Amplifiers.

VHF: (3) Multi-Channel Operation with the Motorola HT200. (5) Wavemeter for VHF. (6) A 4 Element Yagi Antenna for 23Cm.; A 23 Cm. Converter with Hot-Carrier Diode Mixer; Interdigital Bandpass filter for 23 Cm. A Ground Station for Satellite Comm. via Oscar 6; Basic Digital Circuits; A Wideband Pre-Amp. for Freq. Counters to 60 MHz.; A Four Digit Freq. Counter Module for Freq. up to 30 MHz.; A New Method of Freq. Multiplication for VHF and UHF SSB; A Transistorised Power Amp. for 2 Mx using the 2N3632; AM Demodulators using Silicon Semiconductors. (7) Low Cost Hardware for 2 Mx Reception; Using the Motorola TU110 series; Transmitter on 420 MHz. (8) Freq. Syn. for VHF Scatter; Injection Laser Communications; FM Sequencial Encoder; VHF Weak Signal Source.

KEY

(1) "Break-In", Sept; (2) "73", August; (3) "73", Sept.; (4) "Radio ZS", Sept.; (5) "Short Wave Magazine", Sept.; (6) "VHF Comm." August; (7) "QST", Sept.; (8) "Ham Radio", Sept. All issues 1971. —VK3ASC.

HAMADS

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Advertisements under this heading will be accepted only from Amateurs and S.w.l's. The Publishers reserve the right to reject any advertising which, in their opinion, is of a commercial nature. Copy must be received at **P.O. 36, East Melbourne, Vic., 3002**, by **5th of the month** and **remittance must accompany** the advertisement.

FOR SALE: A.W.A. MR20B 3-Channel FM Transceiver complete with control box and Channel A or B crystals, $60. E. Penikis, 8/11 Northbourne Flats, Canberra City, A.C.T., 2601.

FOR SALE: Collins 75A4, immaculate, owned since new, one of the last batch made. Latest Collins mods., mechanical filters 6, 3, 2 KHz. Complete with Panoramascope Panadaptor T200, spare 3AP1s, all manuals, $550. N. Stilwell, P.O. Box 104, Bendigo, Vic. Phone (bus.) 43-1400.

FOR SALE: FTDX100, FLDX2000, Heathkit SB610 Monitor, small Oscilloscope, heavy duty Rotator, Hy-Gain Quad, Heathkit Cantenna, co-ax and fittings (incl. 30 yds. new RG14), etc., etc. Leaving VK so am open to offers. Phone 723-2645 (Melb.) after 6 p.m.

FOR SALE: Gonset 2 mx SSB/AM/CW Transceiver, 4 MHz. coverage, transistorised receiver, mainly transistorised transmitter with 6360 final. With 240 volt power supply and manual, $150. 24 Seafield Ave., Kingswood, S.A. Tel. 71-4671.

FOR SALE to those who know the breed. Collins Communication Receivers R390A and R391. 500 KHz. to 32 MHz., 1 MHz. bands, excellent condition. Price $1100 each. Details on request. VK3IZ, Phone 848-5790 (Melb.).

FOR SALE: Two Pye Mk. I. Transceivers (modified 6 metres AM tunable), 12 volt units, pi output with tx xtal included, repainted grey, $20 each. T.C.A. 1674 Transceiver (2 channel mod. 2 FM), 10 watt output, rocking armature mike (needs AC power supply, circuit included), first class unit, repainted grey, Ch. B xtals included, $55. Write K. Brady, VK2AFF, 24 Barellan Ave., Dapto, N.S.W., 2530.

FOR SALE: Yaesu FTDX400 Transceiver. This unit has had little use and is in as new condition. Excellent performer on all bands, $400. VK5ZK, 52 Arthur St., Plympton Pk., S.A., 5038. Ph. 93-1523.

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NATIONAL Tape Recorder RQ158S, portable, battery operated, with AC Adaptor RP-999; 5 in. reels, 2 track, 2 speed, with mike and instruction book; as new, $80. National Cassette Tape Recorder, latest model RQ209S, battery or AC operated, with mike and instruction book, as new, $55. VK3LC, Alf Chandler. Phone 50-2556 (Melb.).

WANTED: AR7 Receiver with Coil Boxes or AR8 Receiver. Write giving full details and asking price. Graham Douglas, VK5ZIG, P.O. Box 565, Port Augusta, S.A., 5700. Phone 2571.

WANTED: AR22 Rotator or Prop. Pitch Motor with Indicator, in good working order. Contact J. Gravina, 36 Robinson St., Moorooka, Brisbane, Qld., 4105.

WANTED: A.W.A. Green Carphone, type MR10A or MR20A, high band. With or without power supply, control unit or valves. Willing to make a deal with a low band set if required. Gordon Reid, 13 Ashton St., Temora, N.S.W., 2666.

WANTED: Band-change motors and L-R indicator drive transformers to suit 24 volt Bendix MN26 Radio Compass sets. Transformers are marked T16 or A15064. State price required. Also Vintage Radios complete with Horn Speaker, early 1920's, good price paid, send details. O'Brien, Edgar Rd., San Remo, Vic., 3925. Phone 107.

WANTED: Galaxy III. with or without power supply. Price and condition to Ray Malcolm, VK3BAO, Boisdale, Vic., 3860.

WANTED: Rotary Converter to restore R.A.N. Type S Synchronous Rotary Gap Spark Transmitter. Output 70 v.a.c. at high frequency, probably 500 Hz. Unit will probably have 24 field poles and can be identified by an extension shaft coming out one end for driving rotary gap. R. F. Fisher, VK3BAQ, 241 Royal Pde., Parkville, Vic., 3052. Phone 340-5931 (business hours).

WANTED: Someone to repair and re-align No. 122 Transceiver, preferably someone familiar with this type of equipment and am willing to pay the right price for the repairs. Contact York Mendoza on Tel. (Syd.) home 59-4142 or work 59-0401.

WANTED: SSB Transceiver with power supply. Must be in good condition. VK2AFP, R. Gream, 7 Keats St., Byron Bay, N.S.W., 2481.

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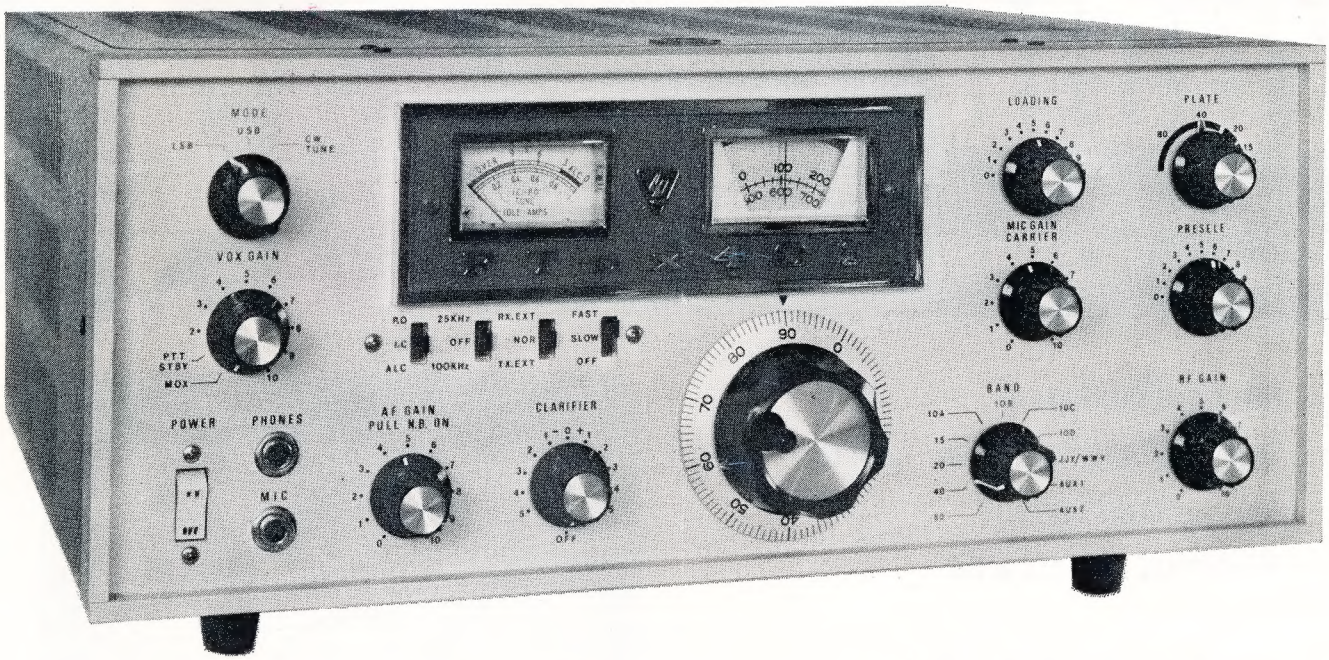

NEW DE LUXE TRANSCEIVER *from YAESU*

Model FT-DX-401

YAESU offers the all new YAESU FT-DX-401 SSB Transceiver. Considered the best buy in Amateur equipment available today, the FT-DX-401 features high power, super sensitivity, and sharp selectivity, in one complete station package. PTT microphone is included. Except for a speaker, no other accessories are needed to be "on the air".

De luxe equipment built-in to the FT-DX-401 at no extra cost includes: AC power supply, noise blanker, dual calibrators (100 KHz. and 25 KHz.), VOX, break-in CW with sidetone, 600 Hz. sharp CW filter, clarifier, phone patch terminal, cooling fan, and WWV 10 MHz. band. Full transceive capability 80 through the complete 10 metre band. Two blank auxiliary positions are provided on the bandswitch.

The FT-DX-401 features velvet smooth tuning with zero backlash planetary gear system. Read-out to 300 Hz. is easily obtainable when calibrated to the nearest 25 KHz. marker. WWV frequency check to crystal calibrator assures "on frequency" operation on all bands.

For DX operation a noise blanker is mandatory . . . the FT-DX-401 has it! Complete with signal threshold control, the blanker picks out noise spikes completely and leaves only clean signal copy.

DUAL TOROID first I.F. stage provides high gain/bandwidth product for double conversion circuit used in the FT-DX-401. This system guarantees linear tuning rate plus high image rejection.

Twenty tubes plus fifty silicon semiconductors make up the active devices used in the Transceiver. The passive crystal filters are of the six-pole type designed for optimum SSB audio quality and sharp CW reception.

The FT-DX-401 was planned and designed specifically for the World Amateur. Export quality, with superior components and finish, specially tested, and including hand-held PTT microphone. Spare parts, personalised 90-day warranty, and continuing service available through your authorised dealer.

Check the specifications and compare your cost. We believe that the FT-DX-401 is truly the best buy in the Amateur field today.

SPECIFICATIONS

Maximum Input Power: 560W. PEP SSB.
Sensitivity: 0.3 Microvolt for 10 dB. S/N (SSB 14 MHz.).
Selectivity: 2.3 KHz. (6 dB. down), 3.7 KHz. (60 dB. down) six-pole crystal filter nominal shape factor 1.6:1 for SSB; 600 Hz. (6 dB. down) 1.2 KHz. (60 dB. down) for CW.
Frequency Range: 3.5 to 4, 7 to 7.5, 10 to 10.5 WWV, 14 to 14.5, 21 to 21.5, 28 to 30 MHz.
Unwanted Sideband Suppression: 55 dB. down (at 1000 Hz.).
Carrier Suppression: 50 dB. down from full output.
Distortion Products: More than 25 dB. down.
I.F. and Image Ratio: More than 50 dB. down.
Frequency Stability: Less than 100 Hz. drift in any 30-minute period after warm-up.
Antenna Impedance: 50 to 120 ohm—SWR 2:1 or less.
Audio Output: 1.5 watts, 350-2200 Hz., 8/600 ohm impedance.
Power Source: 117 or 234 volts AC, 50/60 Hz.
Dimensions: 15¾ inch wide, 6¼ inch high, 13¾ deep.
Weight: 45 pounds.

PRICE $695.00

Optional Extras: **SP-401 Speaker $28.50**
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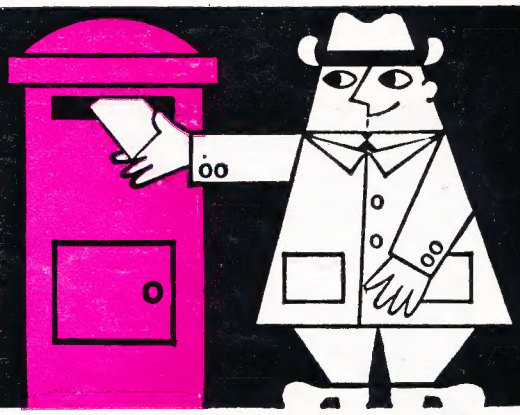

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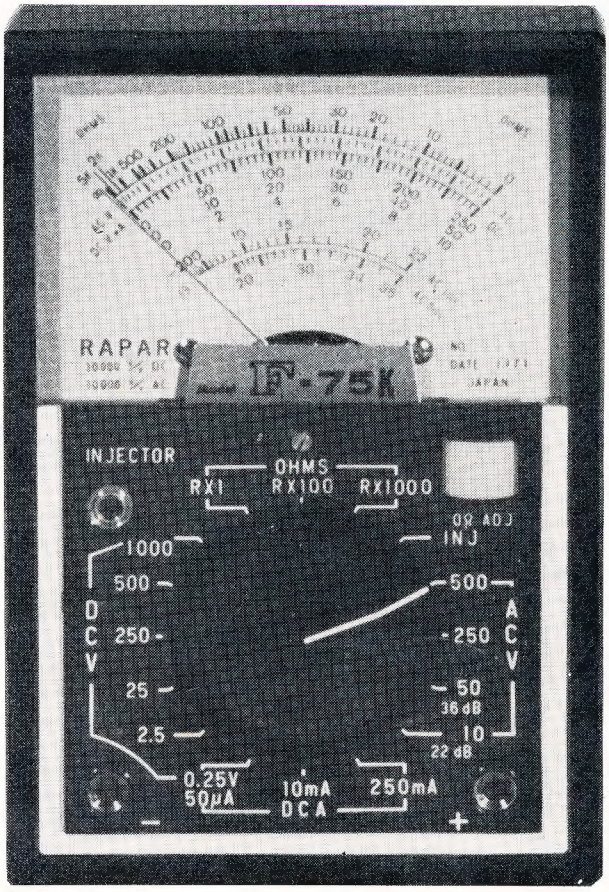

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